

WIRED

AUGUST 1999

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Manufacturing the
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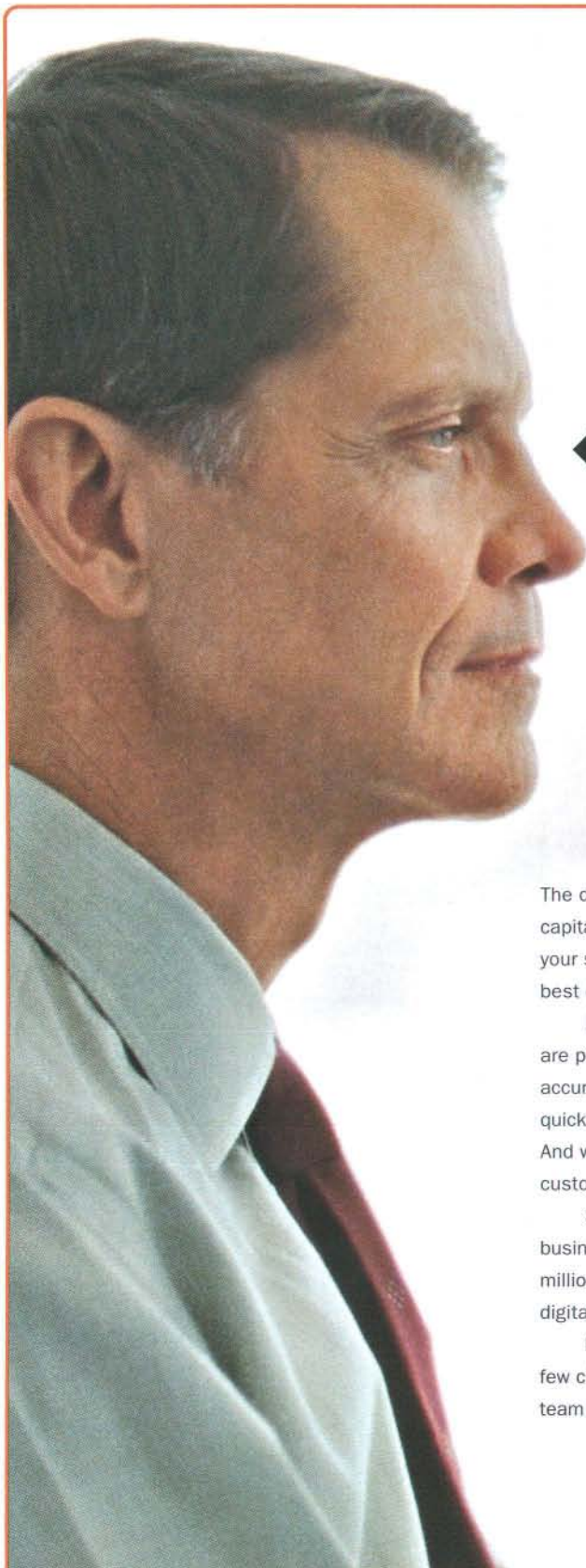


Them.

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The digital economy holds virtually unlimited possibilities for your business. Want to capitalize on everything your company knows, every minute of the day? Want to integrate your supply chain? Want to be closer to your best employees? Your best vendors? Your best customers?

It's all possible. But to do it, you'll need an environment in which all the people who are part of your organization are working within a system that allows a rich, rapid, and accurate flow of business information. An environment where your team acts together as quickly as a single person could act, but yet they possess the insights of the entire team. And when your business reaches this level, where your employees, partners, and customers are all connected, you've got a digital nervous system.

So how far is your company from this ideal? Well, if you're like thousands of other businesses already using familiar Microsoft® tools to help run your company (for example, millions of people use Microsoft Windows® in business every day), the possibilities of the digital economy are closer than you think. Only as far away as your PC, in fact.

Here's an example: Take the widely popular product Microsoft Office. With just a few clicks, you can post documents to the company intranet so that members of your team can review and comment on the document anytime, anywhere. Add to that another

Microsoft offers the best integrated solution from desktop to data center:

Windows - The operating system used by millions around the world on PCs, handheld devices, and servers to bring PCs and the Internet together.

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BackOffice - The flexible server platform for building mission-critical e-commerce, knowledge management, and line-of-business solutions.

FAR from all the possibilities of the digital economy. ▶

best-selling family of products, Microsoft BackOffice[®], and you're a click away from accessing and manipulating all the data in your company, no matter where it resides.

All of which gives you a computing environment that provides unprecedented decision support and quicker response time, and turns workers into knowledge workers.

We'd like to show you how Microsoft Office, the BackOffice family, and the Windows platform can combine with our many hardware, software, and service partners to more quickly and easily evolve your company into an organization poised for success in the new digital economy. An organization that, from desktop to data center, has undergone a quantum shift in business efficiency and productivity, without having to rip and replace your entire information infrastructure. In short, a company with a powerful digital nervous system.

Best of all, you can start your company's evolution to a digital nervous system right now with the help of our many industry partners. Once you get started, you'll be joining many premier companies who are already building or using a digital nervous system, including Barnes & Noble, Eddie Bauer, MasterCard, Dell, Office Depot, British Petroleum, and Nabisco. For complete details and helpful case studies, visit www.microsoft.com/dns

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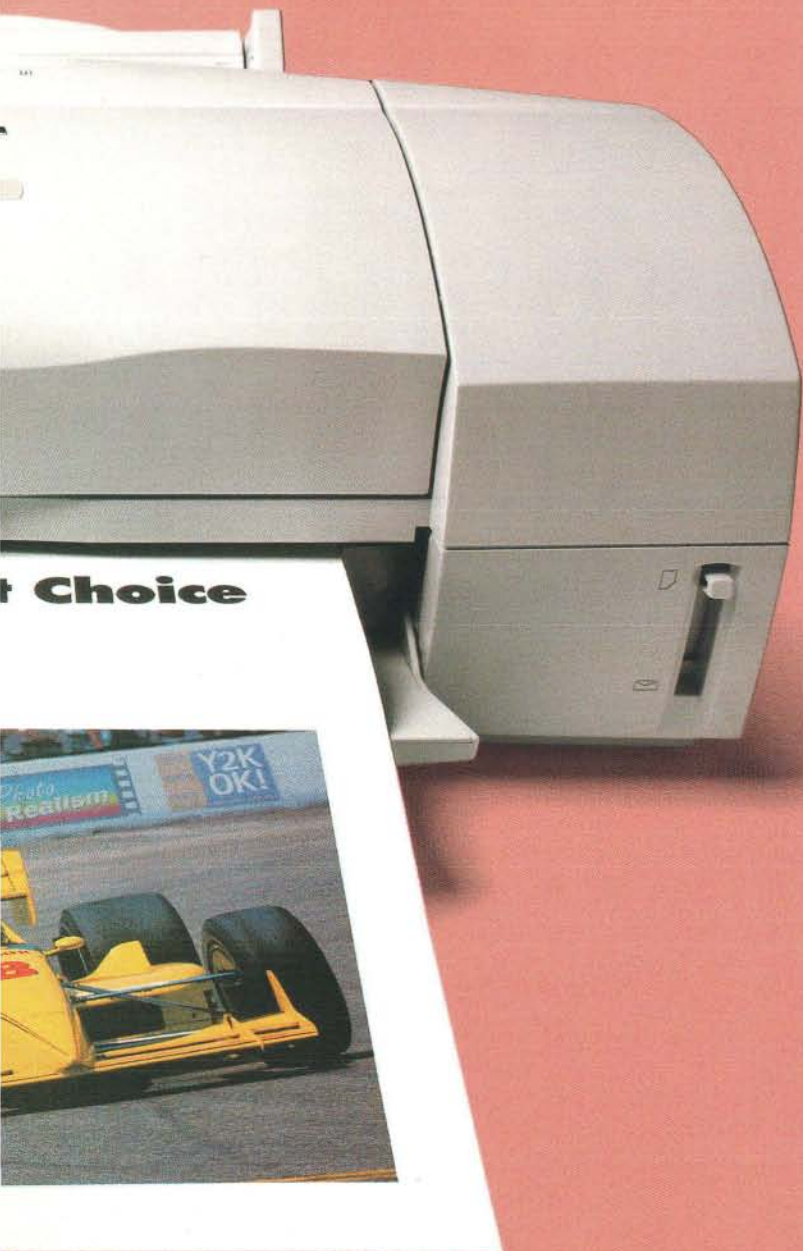
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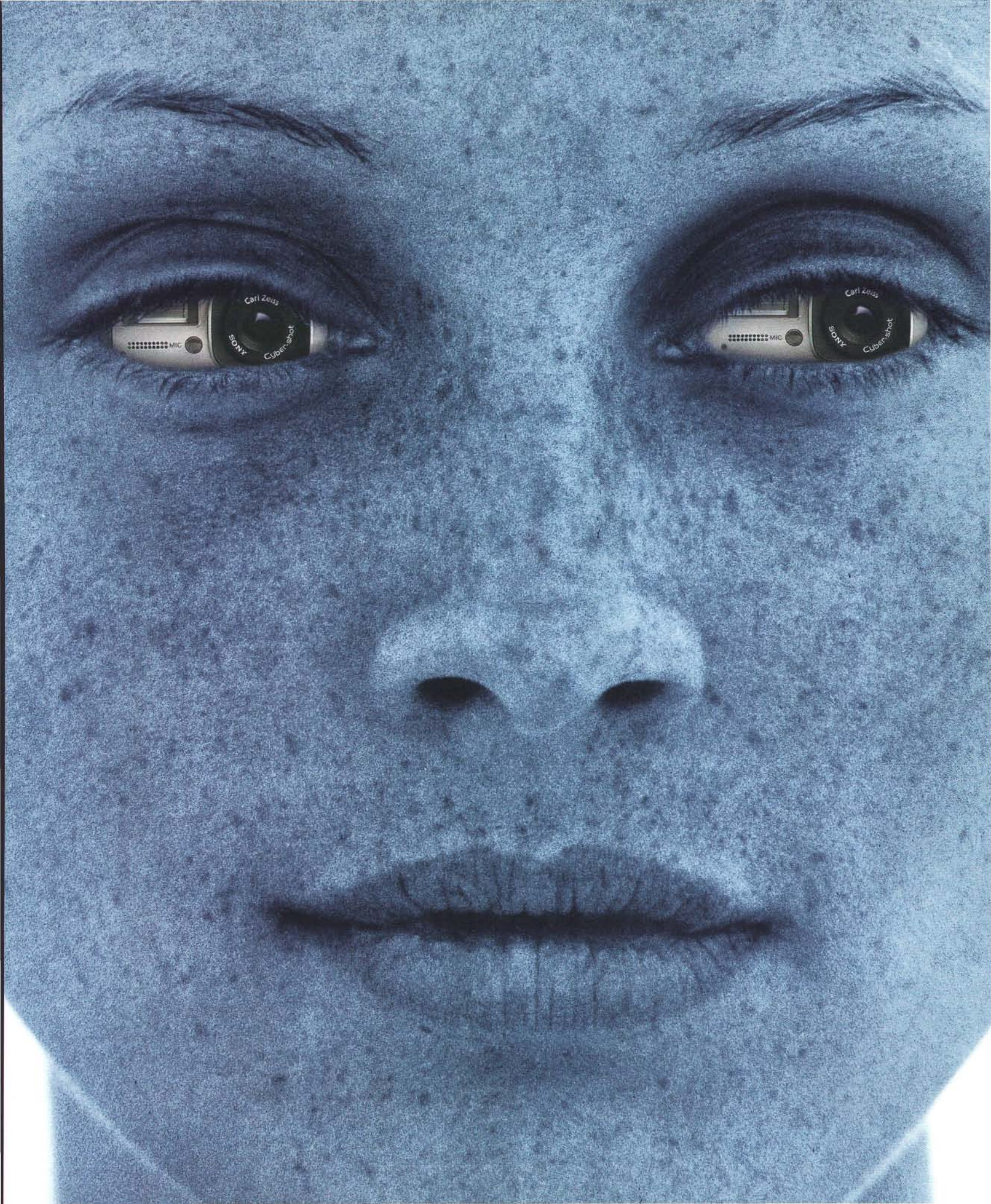


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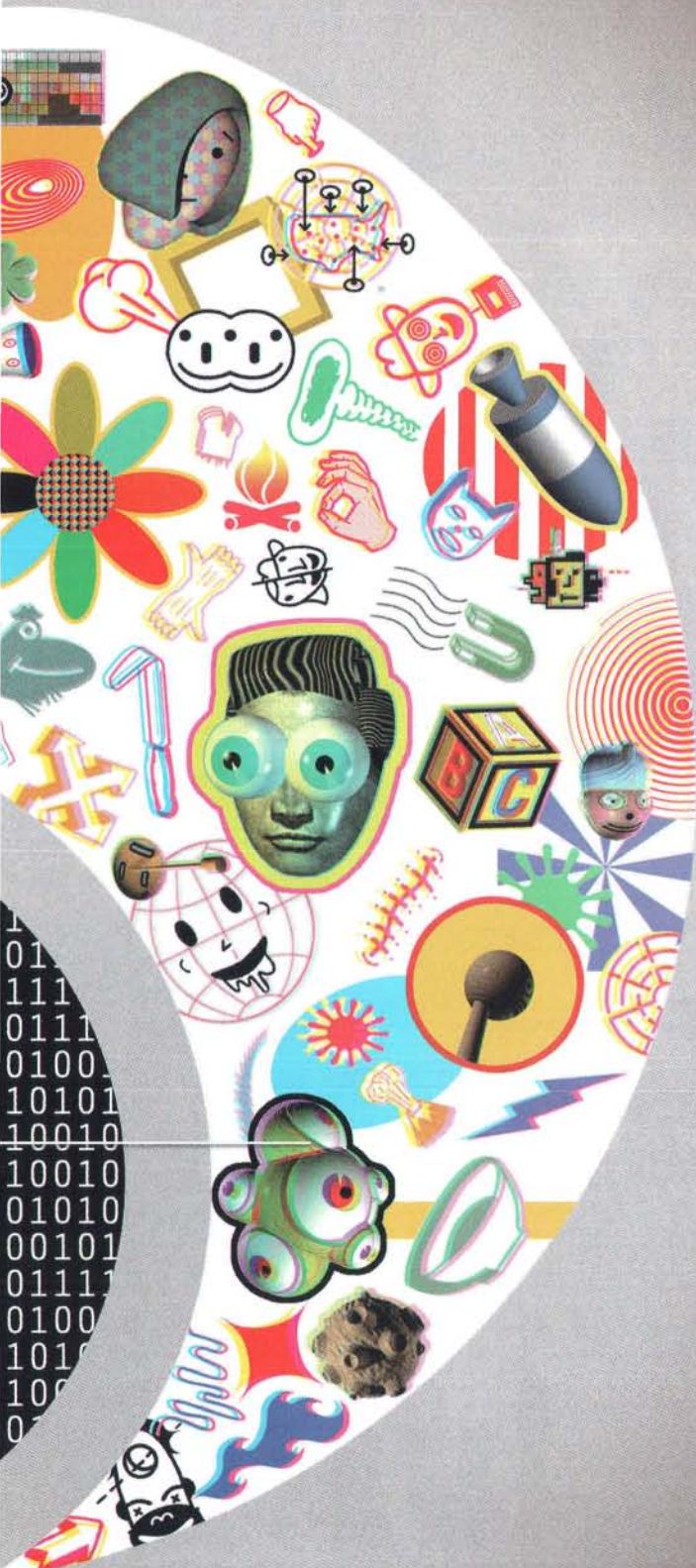
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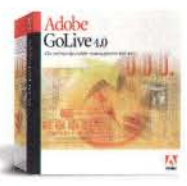




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people, companies, and products that are transforming our world.

Dear WIRED Ones,

All year WIRED gives you our unmatched perspective on the effect of technology on the world around us. Now we'd like to hear from you by asking for your picks of the year's most important people and events in WIRED's first ever Readers' Raves Poll.

We've selected a list of people, companies, products, and websites that have had a significant impact on the world around us. We are asking you to vote on those that you feel have made the most important contributions or innovations in the past year. To enter, please go to www.wired.com/wired/raves. The winners will be announced in WIRED's November issue and honored at a special awards ceremony this October at the landmark Regency Theater in San Francisco.

To thank you for your time, we will automatically enter you into a drawing to win complimentary tickets to the Readers' Raves Awards Gala. You will also be entered to win the grand prize of the ULTIMATE WIRED TOOLS, including a state-of-the-art laptop, PDA, and cell phone valued at \$5,000.

I know you are busy, but I hope you will take the time to give us your thoughts. We value your feedback, because it's your opinions that will make this a success. So visit www.wired.com/wired/raves to participate and thank you for your effort.

Sincerely,

A handwritten signature in cursive script that reads 'Dana Lyon'.

Dana Lyon
Publisher



Contest rules
No purchase necessary. Deadline for entries is August 10, 1999. You must be 18 years or older to participate. Complete contest rules available at www.wired.com/wired/raves.

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job opportunities

Production Artists

Baltimore: We are always looking for people with solid Quark skills to assist our clients with production needs. These positions offer great variety in people, projects, and work environments. 2-3 years of professional experience is required, and Spanish language skills are an additional asset.

Traffic Coordinators

Philadelphia: Previous experience in publishing or advertising environments is preferred. Candidates must be detail-oriented and work well under pressure. Organization and communication skills are also key. Knowledge of Quark, Photoshop, and Illustrator is helpful.

IT/IS

San Francisco: Publishing company is seeking an experienced, motivated person to manage all IT/IS functions. Company network is comprised of PC, Macintosh, NT and UNIX systems. Must have experience with Novell Netware, DOS, Windows, Windows NT, Win95, Mac OS, TCP/IP network planning and administration; various PC productivity applications; data communications; and Internetworking.

Senior Designer / Art Director

Washington, DC: Prestigious firm is seeking a committed, detail oriented designer to head their graphics department. Ideal candidate will have production skills in Quark and Photoshop, and a proven ability to meet deadlines and budgets. Grace under pressure, and an excellent portfolio are essential. Candidates should have web experience and at least 3 current URLs.

Locations:

- Baltimore
- Boston
- Chicago
- Dallas
- New York
- Philadelphia
- Providence
- San Francisco
- St. Louis
- Washington DC

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Technology Service Analyst

St. Louis: This high level candidate should have expertise in Win NT, NT Terminal server, Citrix, MetaFrame, RAS Services, WAN issues such as routers, frame relay circuits and exchange configuration. applicant needs to be well-versed in high-level hardware setup and configuration.

Web Designer

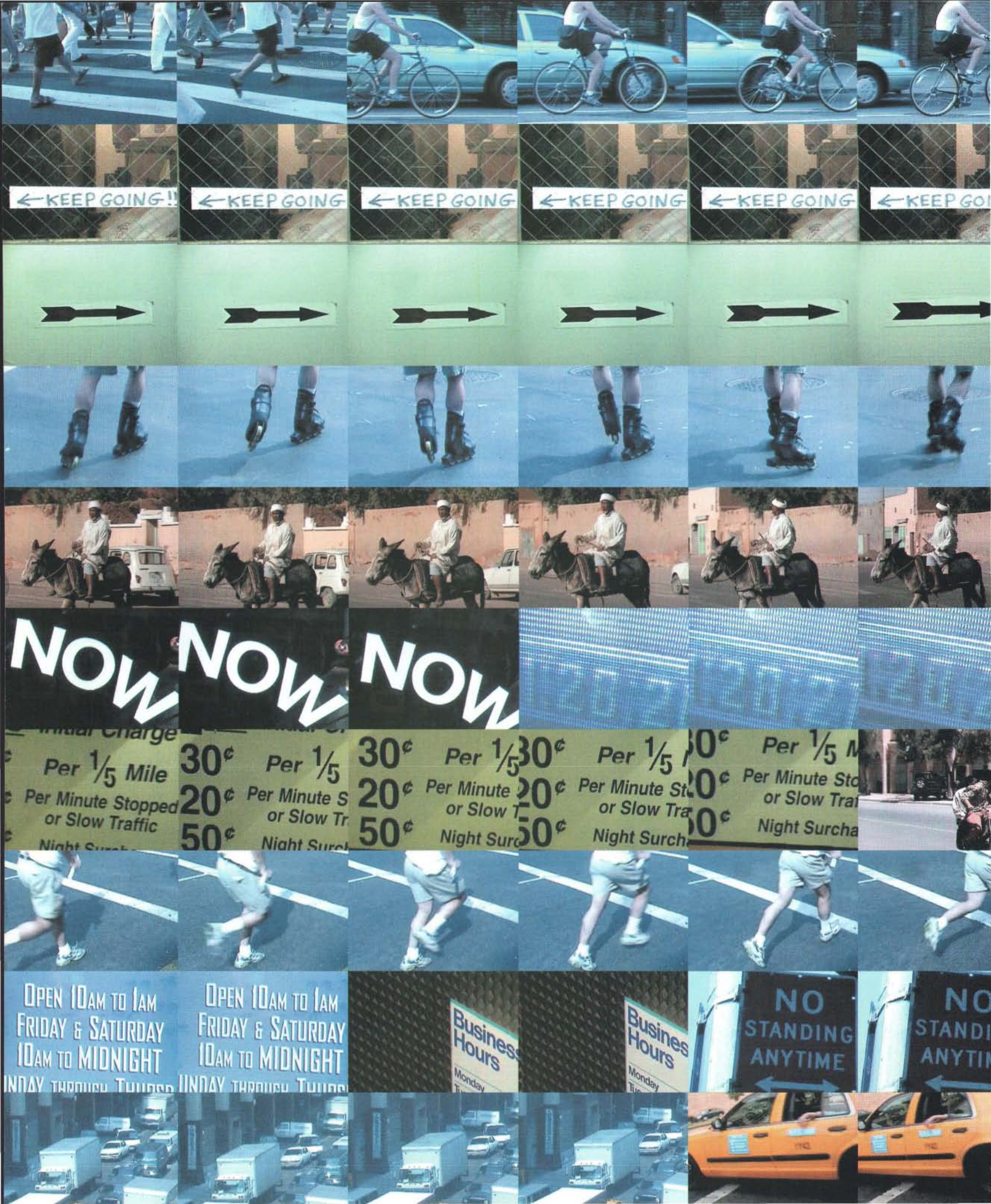
Boston: Mail order office supply company is looking for a web designer to produce advertisements for their site. Must have previous experience with banner ads and strong conceptual and file management skills. Most work will be done in Photoshop, HTML and a WYSIWYG editor. Experience with DHTML and Java scripting is a plus.

Systems Administrator

New York: Entertainment company based in New York is looking for a systems administrator to help maintain their ethernet network. Must have at least two years of experience with Macintosh networks and be detail-oriented and personable.

- Washington DC
- St. Louis
- San Francisco
- Providence
- Philadelphia
- New York
- Dallas
- Chicago
- Boston
- Baltimore

Locations:



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NO STANDING ANYTIME





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10 MINUTE 10 MINUTES 10 MINUTES 10 MINUTES
15 MINUTE 15 MINUTES 15 MINUTES 15 MINUTES
30 MINUTE 30 MINUTES 30 MINUTES 30 MINUTES

CLOSED CLOSED CLOSED CLOSED CLOSED

DONT WALK DONT WALK WALK WALK

PARK CLOSES AT DUSK PARK CLOSES AT DUSK
WILL RETURN IN 5 MINUTES THANK YOU FOR WAITING
WILL RETURN IN 5 MINUTES THANK YOU FOR WAITING

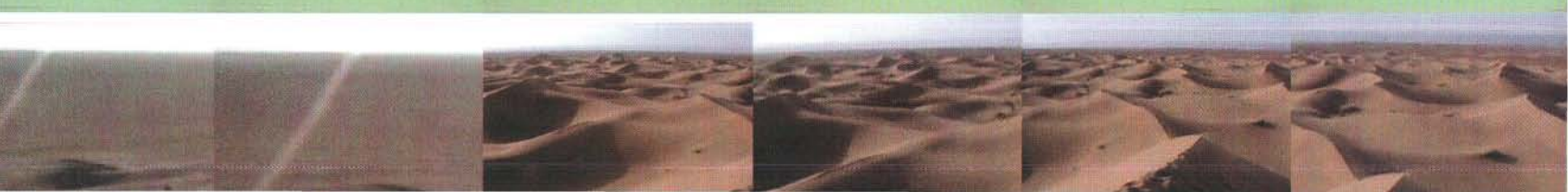


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It is not a thing you ever had. – James Gleick, page 78

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get the skinny

SONY

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right on the frontier of change,
is terrifying."

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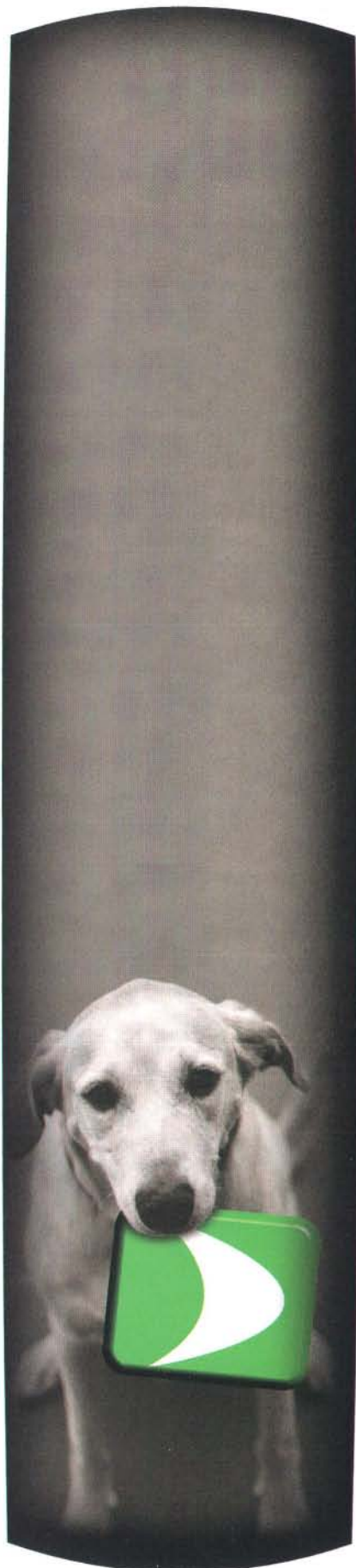
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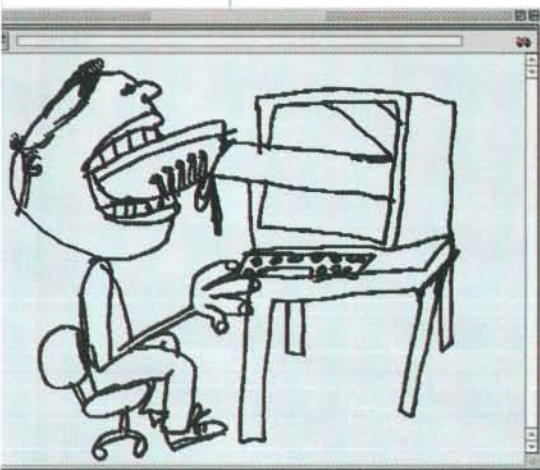


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Daemon Seedlings
 Encrypting email to protect personal privacy or business secrets makes sense ("Daemon Seed," *Wired* 7.05, page 100). Creating a server that automatically deletes email, however, could have only one purpose

– to destroy evidence. Has capitalism evolved to the point that we assume criminal activity is part of the modern business model?

Our challenge shouldn't be to find better ways to cloak the truth – it should be to conduct business in such a way that we won't have to fear the witness stand.

Eric Tully
 eric@tully.com

David Bennahum's article on the consequences of email was fascinating, informative, and frightening. I read it over lunch, then picked up a half-dozen copies of the magazine for my company's legal, tax, real estate, and human resources departments.

Oddly, I had spent the previous evening consoling a friend whose boyfriend had discovered a complete transcript of an ICQ flirtation. She thought he'd never find out, because the record had been "deleted."

David Koehne
 dkoehne@pocketmail.com

I was surprised that David Bennahum did not discuss how easy it is to tamper with email. On many computer systems, it's possible to change the body, date, and header details of a filed message such that no one will detect these alterations. A case in point: What assurance do we have that the colorful email evidence in the Microsoft case has not been altered?

Mark Gerstein
 mark.gerstein@yale.edu

Green Eggs and Brand

What a coincidence that the night before reading Ron Magid's "Product (Re)Placement" (*Wired* 7.02, page 66) I watched a TV adaptation of *The Sneetches and Other Stories*. Magid's story – and Mark Ritcheson's comments on product replacement – reminded me of Dr. Seuss' alternately star-bellied and plain-bellied sneetches.

I can picture companies placing their products in movies only to have their logos replaced back and forth, ad infinitum, with competitors' logos during subsequent releases.

One possible logo-splicing sales pitch: "Oh, the Places You'll (Lo)Go!"

Ben Hanisko
 notso@mindspring.com

Creative Force

For those collectors who want a copy of the first published drawing of the double-edged lightsaber ("Get Mauled," *Wired* 7.06, page 67) seen in *Star Wars: Episode I – The Phantom Menace*, track down the 1994 premiere issue of *Sci-Fi Universe*.

In 1993, I was working for Lucasfilm Licensing by way of Dark Horse Comics (owned by Lucasfilm), designing for the *Dark Lords of the Sith* graphic novel series. The story, set 4,000 years before the rebellion against the Galactic Empire, entered uncharted territory, so we had to submit a proposal to George Lucas for approval. The package included a sketch of the Dark Lord Exar Kun holding a double-edged lightsaber.

The creative genius of George Lucas ("G Force," *Wired* 7.05, page 126) is a gift to our entire culture. But it takes more than that to create an epic on the scale of *The Phantom Menace*. It takes a leader open to the ideas from the army of creative forces in his employ.

Chris Gossett
 tajomaru36@sprintmail.com

"Master of myth," "revisionary," and "Believe the Hype"? Gimme a break. Hype is hype. What the heck has George Lucas revised? He's a good, smart director, but space opera has been old since 1939, when John W. Campbell, editor of *Astounding Science Fiction*, introduced A. E. Van Vogt, Theodore Sturgeon, Robert A. Heinlein, and Isaac Asimov to pulp science fiction readers. The third sequel to a 1977 milestone ain't gonna change that or anything else.

Eric Solstein
 New York

Holding Pattern

"Ethernet at 60,000 Feet" (*Wired* 7.06, page 150) has two implications. First, novelty continues to come from dreamers and schemers like Burt Rutan, not from the likes of Boeing and Lockheed-Martin. Second, nothing is ever new. In the '60s, a friend of mine flew a Piper Cheyenne I for CBS-TV, serving as an uplink and downlink for live events. Then, as now, I wonder about the sanity of a pilot circling for hours. My friend will be getting out of the home soon; I'll ask him.

Tom Napton
 elkhill@ix.netcom.com



Exar-Kun, as drawn by 24 year old Star Wars artist Chris Gossett

RANTS & RAVES



Local Asia Network

In "Empire of the Son" (*Wired* 7.05, page 160), writer Douglas McGill quotes James Liu as saying, "In the Western world, the individual is valued more than the group, so information flows from the group to the individual; in Asia it's the opposite." It seems to me that Richard Li's venture is about enabling communication within the group rather than disseminating information via the Web. If Pacific Convergence Corporation is successful, it will accelerate the pace of change in China and across Asia

by tightening the complex relationships that govern the Chinese business world.

The Chinese have always strived to retain their unity across the landmass. Li's network will strengthen that sense of nationhood, and will help dispel the myth that economic prosperity demands westernization and the dilution of Chinese culture.

Nicky Hickman

nicky@themorpheusconnection.freemove.co.uk

Open-Source Surgery

I found "Open Season" (*Wired* 7.05 page 140) exciting and informative, if a little brief. Open-source software will surpass many commercial systems because it springs from individual passion.

However, I take exception to Andrew Leonard's statement that "there are plenty of situations in which releasing source code plainly doesn't make good economic sense." As an example he cites "extremely high-value-added programming projects, such as advanced digital-imaging software employed in life-or-death medical procedures."

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Will Schroeder

will.schroeder@kitware.com

Tempest in a Teapot

"Powerless" (*Wired* 7.04, page 118) makes such great copy, with its hypothetical icy wastelands and its future-fact hype (refutable only months after the magazine sells), that it's a wonder *Wired* didn't succumb earlier.

I'm from Mobile, Alabama, where there are more hurricanes than snowstorms. Sure, the electricity goes out, but all the stores and gas stations have generators, so it's no big deal. The real problem is, you can't go outside for a day or two without being lifted and thrown into a tree at 80 miles per hour. When the storm is over, there's plenty of gas at the station and money in the bank, but you can't get there, because downed trees and power lines barricade the streets. But we just clean it all up and wait for the next hurricane. We don't kill each other (although we are armed, belligerent rednecks) or go insane.

But you're in touch with Cobol programmers, so I guess that also makes you experts on civil engineering, group psychology, and prophecy. Anyway, it will all be over soon – both Y2K and the media virus it has spawned.

Curt Cloninger

curt@lab404.com

Planning Ahead

In "50 Ways to Spend a Lot of Money" (*Wired* 7.05, page 81), author David Doty includes suspension costs for two cryonics life-extension organizations, CryoCare and Alcor. To highlight the extravagance, Doty doesn't mention that almost every person signed up for these services pays through a life insurance policy that names the suspension organization as the beneficiary. Term life insurance policies cost very little. Even with Alcor's membership fee and \$90 quarterly dues, neurosuspension (head-only) comes out to about \$40 per month. Dying and being suspended is the second worst thing that can happen to you. It makes economic sense to avoid the worst.

Matthew Gress

matthew@gress.com

Undo

False Start: According to the White House Millennium Council, the new millennium begins January 1, 2001 ("50 Ways to Spend a Lot of Money," *Wired* 7.05, page 81). ■ **Credit Debt:** "Suggested Reading" ("Free Enterprise," *Wired* 7.05, page 146) was compiled by the *Wired* editorial staff, with quips and descriptions from Paul Boutin. ■ **Loud and Proud:** Dave Fitches and Dave Burlovich, pictured to the left and right of BigLex in "Shout It Out" (*Wired* 7.06, page 190), are from LoudFactory. ■ **Close Call:** Virtual Ink's phone number is +1 (617) 623 8387 ("High Marks," *Wired* 7.06, page 70).

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Mouse Flick

Stuart Little, en route to the big screen in December, will stop over at Siggraph in August. But despite this appearance at the showcase for all things CG, John Dykstra, the senior visual f/x supervisor for the movie, insists

that *Stuart* is all about character, not effects. "This is the biggest risk I've taken in a long time," says Dykstra, whose résumé stretches from *Star Wars* to *Batman & Robin*. Not just because his group worked with relatively

untested animation tools – like whisker twisters and tail wagers – developed for the project. It's that in Hollywood, eye-popping, jaw-dropping, gravity-defying effects are the easy part – it's everyday reality that comes hard.

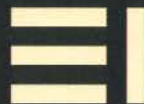
And this familiar character is meant to live outside the sci-fi fantasyland of Gungan warriors, meant to look as real as Stuart's little fur-and-blood cousins, not to mention his flesh-and-blood costars. – *Jessie Scanlon*

Air Heads

The Airjet Paper Mover makes high-speed printing a breeze. Developed at Xerox PARC, the prototype can whip a sheet along a precise path on the computer-controlled bed of 576 air valves, while 32,000 sensors track the paper's location.

"This would really change the architecture of printing systems," says researcher Andrew Berlin (left). The technology will likely appear first in copiers and high-speed printers, but the Document Company won't stop there.

"There are many flexible objects that you may want to move without touching," says fellow PARC scientist David Biegelsen (right), "from uncured rubber to pastry dough."
— David Pescovitz



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The payoff for advertisers? "You are creating your own medium," says Michael Forte, CEO of Spectacolor, which built this mega-sign. It's a medium with a powerful multiplier effect: The square's 100 signs are eyeballed by 1.5 million pedestrians a day and broadcast to millions more via live-in-Times Square MTV feeds. Not to mention the tourists who take some 99 million snapshots of the square every year. That fact hit home at Kodak, which unveils its new Times Square LED screen with a digital feed this fall.

– Patrick Symmes



Chris Carter's Parallel Universe

It's no secret that *X-Files* creator Chris Carter has a military-industrial complex. Now he's fighting the future on a new front: *Harsh Realm*. Fox's fall series follows Tom Hobbes, a veteran of the ground war in Sarajevo, into a hyperreal combat-sim that higher-ups maintain is "just a game." *Harsh Realm*, it turns out, plays more like *The Odyssey* for the Doom generation. "I'm interested in the dark side of technology and human nature," says Carter. "How does a world where the code is still being written shape up when there's no morality, no God, no standards of conduct? If you exist in two worlds at once, where does your soul reside?"

This existential exercise arrives amid ongoing controversy about media violence. "We're violent by nature," responds Carter. "There will be wars. But a virtual surrogate, like a good story's catharsis, may help purge us of our warlike tendencies." We want to believe. — William O. Goggins

IMAGE: JOHN CLARK; GROOMER: LAURA MOBBBERG/CLOUTIER



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Puppet Master

Puppets are simply the most intimate and spontaneous form of animation," says Barry Purves. The British filmmaker uses stop-motion techniques on his manikins to tell twisted and emotional tales historically reserved for human actors.

There is nothing digital about his production of the tragedy *Rigoletto* and his lighthearted opera about Gilbert and Sullivan, both of which will be shown in August at the new Mass MoCA gallery in western Massachusetts. Yet digital animators are

drawn to Purves' style, inspired by his ability to bring emotion to the screen. He's led seminars at Pixar and worked with Tim Burton on *Mars Attacks!* (Over budget and short on time, Burton eventually went with CG Martians based on the puppet master's work.)

Purves is no analog purist - he hopes to someday bring his creations into the digital domain for a grand-scale version of a children's opera based on Noah's ark. Still, he says, "I appreciate the flesh-and-blood feeling of a puppet." - David Pescovitz

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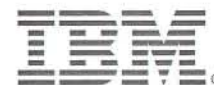
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On the Net, smaller is better. That's why the Internet ViewCam records video and sound in MPEG-4 format, one-third the size of old MPEG-1. And at less than 5.2 ounces and 3.5 inches square, the camera itself is ultracompressed. The video plays in a small window on your computer, and an hour's worth fits onto one 32-Mbyte card. A rotating lens shoots from any angle, so someone's concealed ViewCam may be taping you now – and anything you do might be all over the Net by tomorrow. Internet ViewCam VN-EZ1U: \$699. Sharp Electronics: +1 (201) 529 8200, www.sharpelectronics.com.

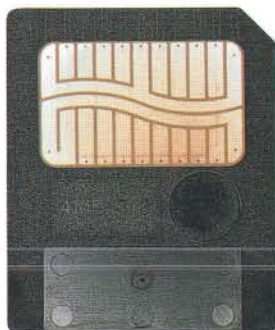


Unmistakable Signals

For all the advantages of HDTV, its signal is generally more fragile than analog NTSC. Reflections that conventionally cause ghosting can make HDTV reception drop out completely. Terk Technologies has responded with the eye-catching TV60HD antenna: Steel shielding protects broadcast signals from interference, while a helical design lets the directional outdoor antenna receive both UHF and VHF, despite its relatively slender profile. To make things even clearer, a preamplifier boosts the signal to the television. TV60HD: \$399.95. Terk Technologies: +1 (516) 543 1900, www.terk.com.

Multiple Personality

Call it a modem/speakerphone or a fax/answering machine – the SmartMemory 56000 defies categorization. Once it's connected to your PC and phone line, the device works as a paperless fax, a 56K modem, a digital answering machine, and a speakerphone, all controlled by a handheld remote. It calls or pages when messages, faxes, and emails arrive, and the busy traveler can retrieve them all – even the faxes – from anywhere. You can store anything the SmartMemory 56000 receives on removable SmartMedia cards (enlarged near left), so you can save your friends' late-night ramblings for posterity. SmartMemory 56000: \$179. Olitec: (800) 221 2882, +1 (510) 649 4924, www.olitec.com.



IMAGES: WILLIAM FAULKNER

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Mixing Colors

Serious audiophiles insist on neutral colors, but Pioneer's musiQube mini-system doesn't take music so seriously. Aimed at teens, the flexible bookshelf stereo has a remote control, plays CDs and radio, and wakes you up in time for morning classes. Connect the optional MiniDisc recorder/player and you can mix SoundScapes into the music, adding crashing waves or chirping crickets to your hip hop — just like the kids in Japan do. musiQube with MiniDisc: \$600. Pioneer Electronics: +1 (213) 746 6337, www.pioneerelectronics.com.



The Promised LAN

3Com can finally unchain you from your desk. The AirConnect wireless LAN runs faster than Ethernet and keeps you connected anywhere on-site. To unwire a building, you install Access Point "bricks" on the ceiling every 250 feet. Each one supports up to 64 devices equipped with wireless PC cards. AirConnect uses the IEEE's long-awaited 802.11 standard, so it promises to work with future products and systems. And think how much room you'll have for those desktop family photos. AirConnect: approximately \$2,500 for three PC cards and one Access Point. 3Com: +1 (408) 764 5000, www.3com.com.

Thin But Healthy

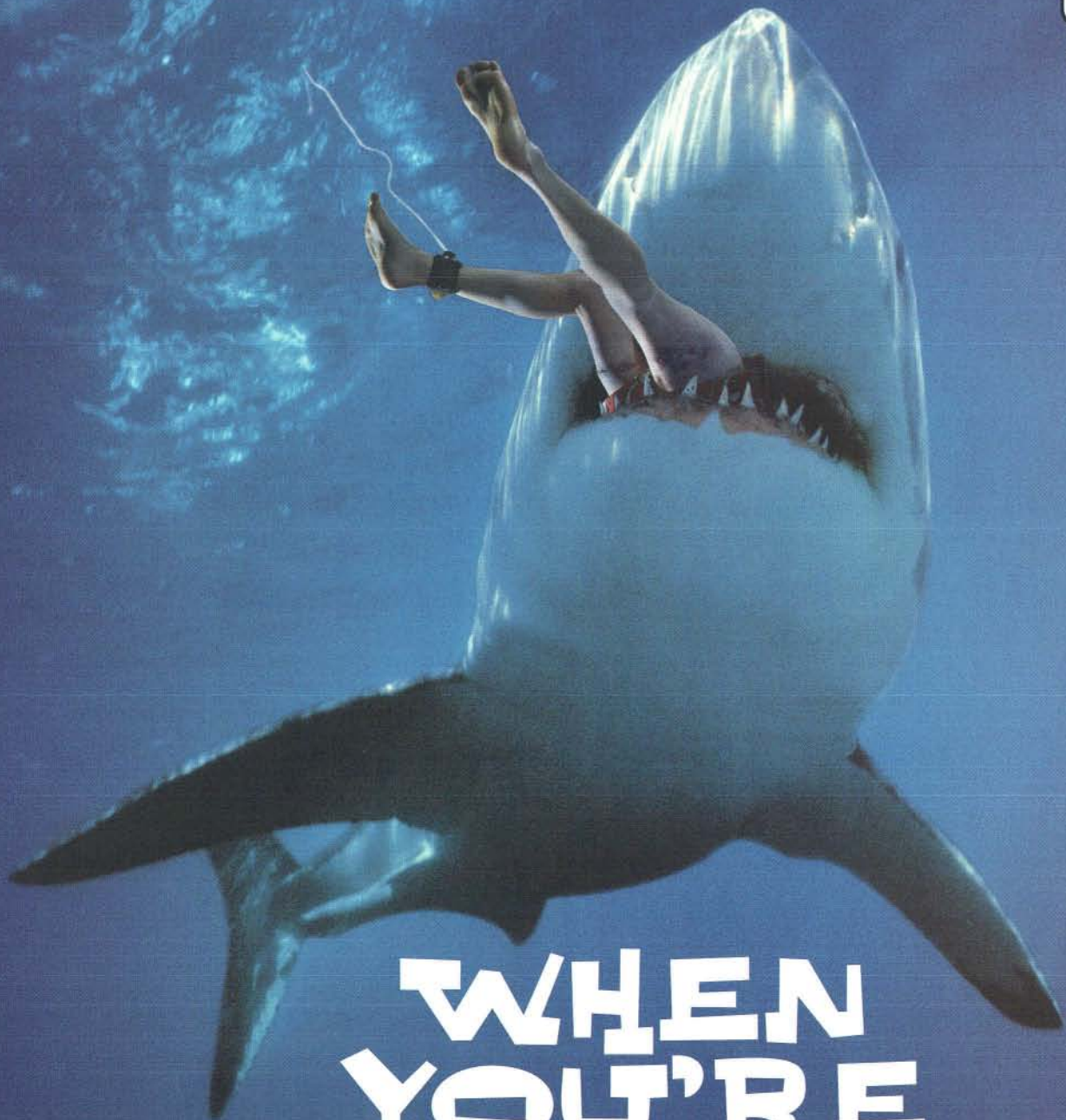
Don't misjudge the SuperSlim Pro. At 3.5 pounds and 1 inch thick, it's just a wisp of a thing, but few other ultra-light notebooks use a Pentium II, and its XGA display shows more detail and drives beautiful presentations. It also has more ways to interface than a full-size laptop: a firewire port to move large sound files and still images, fast Ethernet, a V.90 modem, and a slot for Sony's own Memory Stick flash ROM. This little device is one of the smartest around. Vaio Z505SX SuperSlim Pro: \$2,999. Sony Electronics: (888) 315 7669, www.sony.com/pc.



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For Amusement Only

The problem with old-fashioned pinball is that the targets don't explode when you hit them. How unsatisfying! Pinball 2000 adds videogame mayhem to authentic pinball action. Far-out animations project onto the glass in back, creating an unworldly mix of physical and virtual realities. The machine itself is a pinball "platform" that converts to different games in minutes. In the first Pinball 2000 game, *Revenge From Mars*, hostile Martians surround an open playing field. Pinball 2000 with *Revenge From Mars*: \$4,300. Williams Electronics Games: +1 (773) 961 1000, www.pinball2000.com.



Soapbox

Do people walk right by you and ignore your dire warnings? Maybe you just aren't *loud* enough. Suitable for both street-corner rants and board-room earnings presentations, Fender's Passport P-150 packs a public-address system into a 28-pound suitcase. The two 75-watt speakers draw from a novice-friendly mixer that can take three mikes and one line input. You can even add reverb — a nice Fender touch. The system sets up in minutes, and includes a microphone. You can stand on it (so people look up to you), and with the optional battery pack you can run cordless for eight hours — a full day shift of spreading the word. Passport P-150: \$699. Fender Musical Instruments: +1 (602) 596 9690, www.fender.com.

Mighty Mouse

Unlike older optical mice, Microsoft's streamlined IntelliMouse Explorer needs no pad; it correlates 1,500 images per second to track movements on almost any surface and delivers the information at 12 times the typical rate. Due out in September, the ball-less wonder works through either a PS/2 or USB port, and its scrolling/zooming wheel and customizable buttons make frequent operations reflex-fast. Now if Microsoft would only stop adding *Explorer* to every product name, they'd have it made. IntelliMouse Explorer: \$74.95. Microsoft: +1 (425) 882 8080, www.microsoft.com.



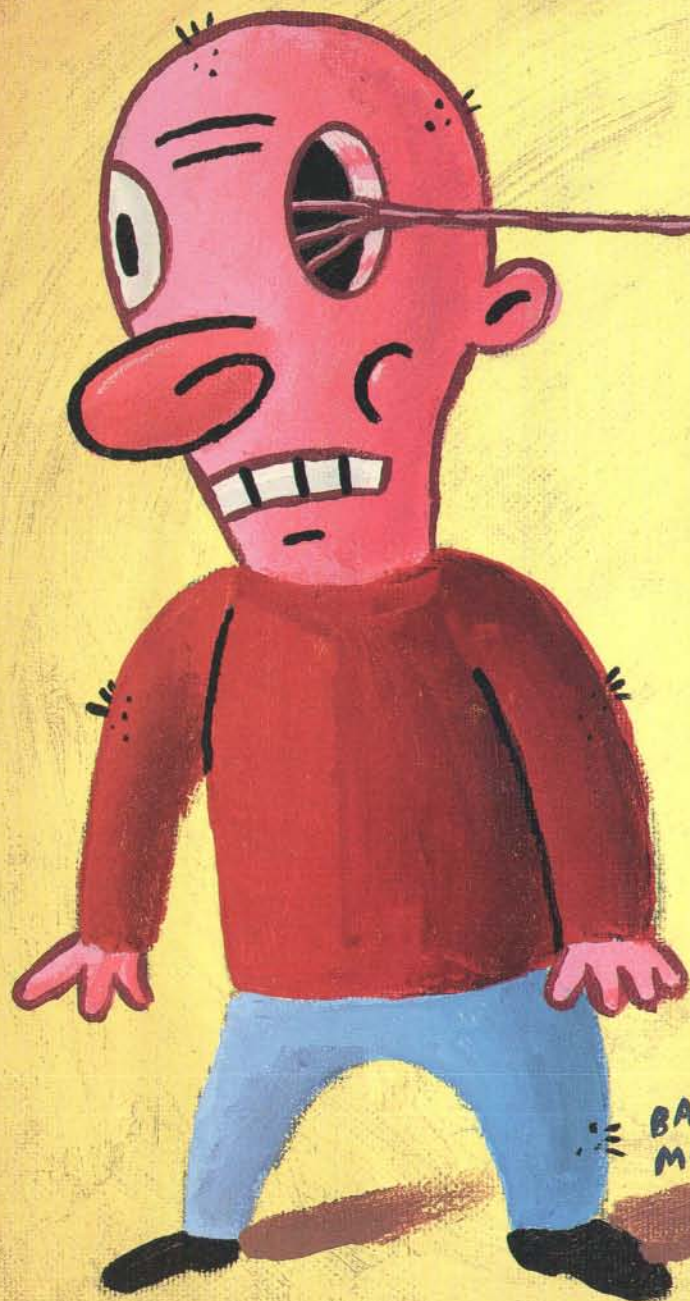


THE BOMBAY SAPPHIRE MARTINI. AS INTERPRETED BY ADAM TIHANY.

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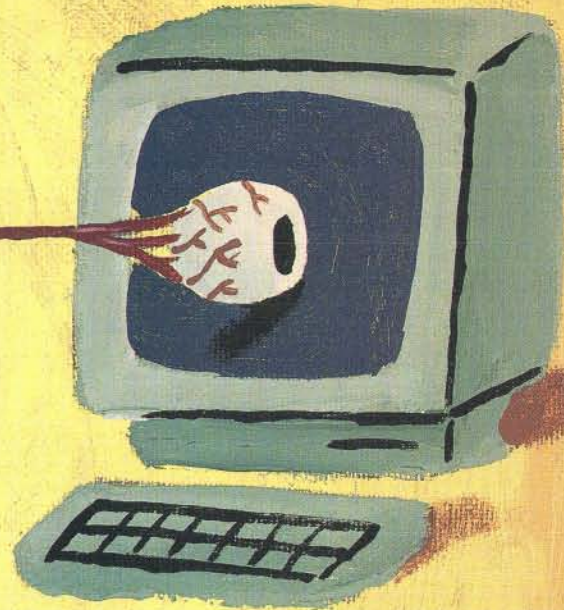
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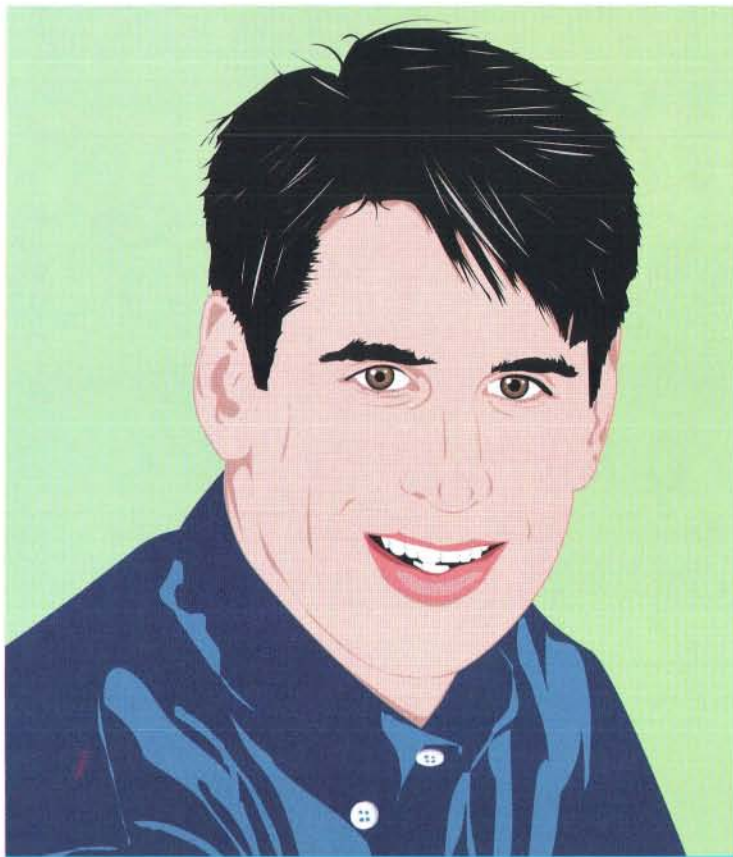
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MUST READ

August

Hollywood at War: The Sequel

MILITARY Half a century after Tinseltown first produced army training films, the major studios are once again gearing up for battle. At this month's annual Siggraph conference, the Secretary of the Army will announce a new partnership among Hollywood filmmakers, the US Army, and a Southern California university to create an LA research center for computerized virtual environments and warfare simulation. The military has already budgeted \$50 million for the project, which will include a mission rehearsal theater in Marina del Rey. *Saving Private Ryan* might be easier the next time around. - James Der Derian



Welcome to the Gurley show.

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YOUR TURN

TIRED

- Portals
- Virtual communities
- Monet
- Psychotherapy
- Porn sites
- Simply Palm

WIRED

- Content destinations
- Distance families
- Manet
- Friends
- Good books
- Simply paper



BY PATRICK NAUGHTON
Starwave president and CTO

Run With the Bulls

VENTURE CAPITAL Bill Gurley, the newest partner at venture firm

Benchmark Capital, may not have the star power of Morgan Stanley's Mary Meeker, his cohost at July's Internet Summit '99 conference. But just give the 33-year-old a few months.

Gurley cuts an imposing figure - both physically (6'9") and among venture capitalists. His "Above the Crowd" column in *Fortune* and on CNET - incisive takes on high tech peppered with classic rock lyrics - has become a crib sheet for business strategists. Formerly a design engineer at Compaq, Gurley hit it big in investment banking as the

lead analyst on Amazon.com's IPO. Now at Benchmark - which he likens to the old Chicago Bulls - Gurley personifies the new breed of young investor-consultants who, so far at least, can do no wrong.

Lately, Benchmark's hit nothing but Net. The company funded eBay and shared in billion-dollar IPOs for Critical Path, Scient, and NorthPoint Communications. Nasdaq permitting, the firm may score again with upcoming IPOs for Ariba and Red Hat Software.

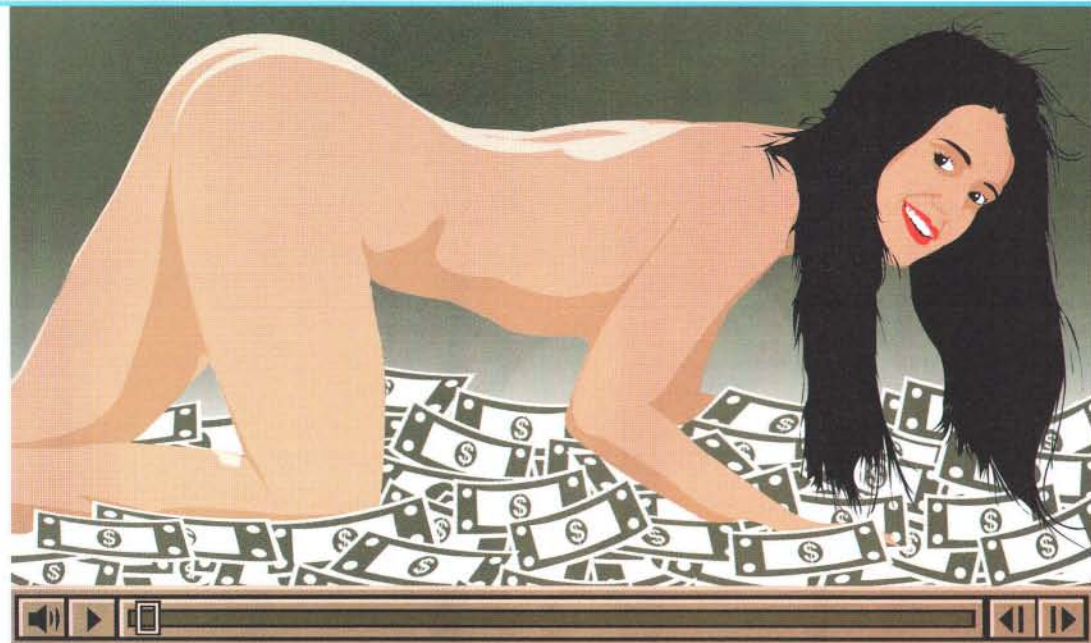
"We're having fun," Gurley confesses, looking almost guilty. "With this job, you get a look at everything. You think about

where the world is going."

One clue to where he thinks it's going came in June with his investment in Respond.com, a site Gurley says will revolutionize online retailing. For the sold-out Internet Summit, sponsored by IDG's *Industry Standard*, he and Meeker attracted AOL's Pittman, Amazon's Bezos, Excite's Bell, Broadcast.com's Cuban, Yahoo!'s Koogler, VC legend Doerr, and Net pioneer Andreessen. Even Gurley claims astonishment at the lineup.

"I'm just a simple guy from Texas," he says.

Yeah, and Amazon's just a place to buy books. - Brad Wieners



Initial Porno Offering

IPOS You'd think online adult entertainment would be an investor's wet dream, wedding the Internet stock frenzy with the ingredient most Net companies lack - profits. But taking porn public is proving to be a hard sell on Wall Street.

Two online porn purveyors trying to launch IPOs, Internet Entertainment Group (IEG) and Efox.net, have found so far that traditional routes to the market aren't getting them anywhere.

"It'd be a waste of time to approach any of the investment banks," says Joseph Preston, president of Efox, a recent startup. "If Wall Street didn't mind the adult content, IEG would have been public at least a year ago."

To go public, digital skin traders may need to be as creative about financial engineering as they have been with technology. "We're doing a self-underwritten public offering," Preston says. He

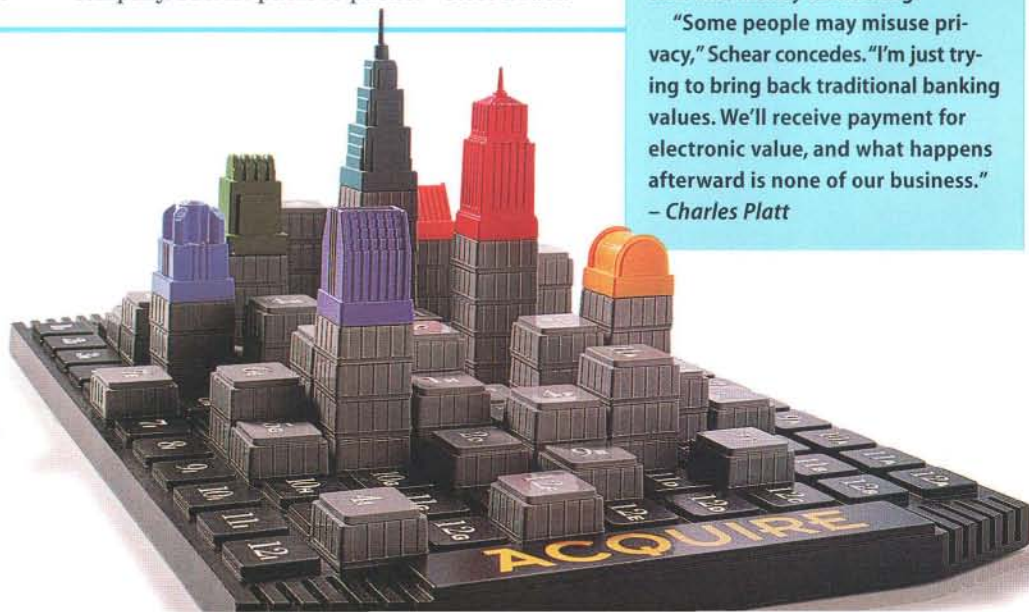
hopes to raise \$7.5 million by offering stock in Efox directly to the public, similar to what Wit Beer did a few years ago. If Preston can get more than 25,000 people to pony up \$300 apiece for his shares and find three market makers to sponsor him, he'll qualify for Nasdaq listing and become daytrading fodder.

IEG's Seth Warshavsky has been trying to mount an IPO for more than a year and insists, "We have some good banks lined up." The latest rumor is that IEG, which claims annual sales of more than \$50 million, will try an obscure financial end-run known as a reverse merger. Using his cash-engorged sites such as Club Love, Buttsville, and Manhole.com, Warshavsky would buy out a penny stock, take over its Nasdaq symbol, and then fold IEG's operations into the already-listed company. Presto: pubic to public. - *Steve Bodow*

Board Room Games

MERGERS AND ACQUISITIONS Wannabe corporate raiders can sharpen their skills with the help of Acquire, a new board

game from Hasbro subsidiary Avalon Hill (www.avalonhill.com). Set to hit stores in late November, Acquire arms players with seed companies, stock certificates, and a fistful of cash, then pits them against one another in the most dangerous game of all: the battle to assemble the largest corporate empire. Years ago, a game like this would have been called Monopoly; today, gobbling up the competition is just business as usual. - *Jennifer Hillner*



Stash the Cash

EMONEY DigiCash founder David Chaum worried that completely anonymous electronic cash would be dangerous stuff, ideal for money launderers or drug cartels. So he designed his eCash with some built-in accountability.

But when DigiCash went into Chapter 11 late last year, it left the once proprietary technology open to the very practices Chaum feared. First up: eCache, software designed to make electronic money harder to trace than cash itself.

Led by Citicorp R&D alum Steve Schear, the eCache team reverse-engineered DigiCash's micropayment protocol and developed its own client-side software. eCache may infringe on DigiCash patents, but even if Schear can't get permission to release the application, he says that won't stop him.

"We can still distribute it from Web sites in countries such as South Africa, where the patents aren't recognized," he explains.

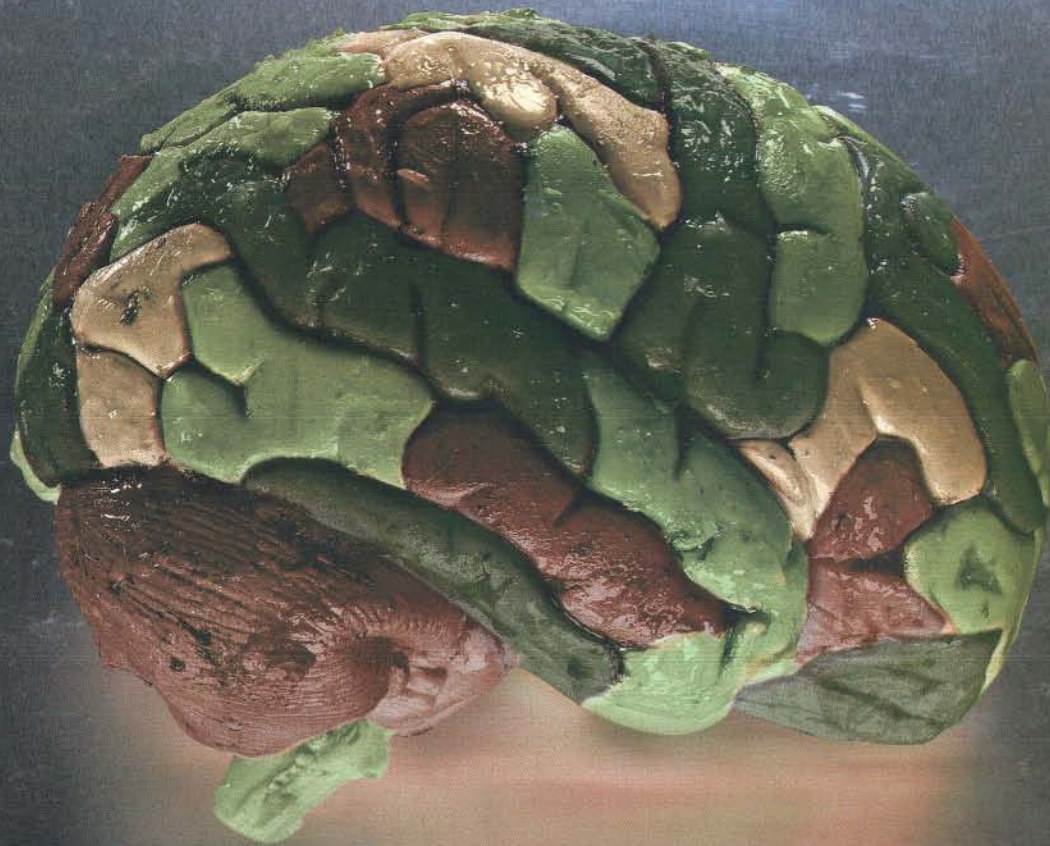
Anyway, eCache isn't aiming for the mass market - just the cash market. "I'm looking for businesses and wealthy people who want to conduct truly private transactions of unlimited value," says Schear. "If you want to buy a yacht without going through the banking system, I'll provide a way to do that."

Will eCache be used for tax evasion and money laundering?

"Some people may misuse privacy," Schear concedes. "I'm just trying to bring back traditional banking values. We'll receive payment for electronic value, and what happens afterward is none of our business."

- *Charles Platt*

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www.nintendo.com Game and System sold separately.

Jim Clark's Rich Pitch

HIGH FINANCE "The nightmare begins at tax time," says Jim Clark, the 55-year-old computer legend whose three startups – SGI, Netscape, and Healtheon – have him juggling \$2.5 billion in personal assets. Clark was shelling out \$400,000 a year on legal and tax services before he tapped former KPMG financial adviser Harvey Armstrong to be his personal CFO. "I was paying a huge amount to collect data for taxes, and stuff was still falling on the floor," Clark says. Ever the entrepreneur, he saw a business opportunity in his problem; enter a new startup called myCFO.

Think of myCFO as a Quicken for the stinking rich. The service helps wealthy people manage and track their personal finances online. Everything from investments, bank statements, and bills to those annoying yachting expenses is stored in a secure, digital repository. "We're not trying to replace brokers or accountants – we're creating an integrated system for them all to use," says Clark, who will pump about \$5 million into the Mountain View startup, which opens its virtual doors early next year.

Initially, myCFO will target people with "complex financial lives," the lucky 3,000 to 5,000 Americans whose net worth exceeds \$50 million. Eventually, the service will extend to those who have managed to scrimp and save a mere \$5 to \$10 million. That may sound like a niche market, but Clark is targeting the wealthy for the same reason Willie Sutton robbed banks: That's where the money is. Today, the richest 1 percent of the US population – about 2.7 million people – account for 40 percent of the wealth.

@Home CEO Tom "TJ" Jermoluk, who is both a myCFO investor and board member, describes himself as a poster child for the service. "I keep track of billions for my com-



The rich are different from you and me – they have myCFO.

pany, but I don't have the time or patience to do it for my own finances. It strikes an immediate chord with people I've talked to. They almost have a sense of desperation about their financial morass."

For the rest of us who don't qualify for the service, there's still a chance to take advantage of myCFO. Clark is already talking about taking the company public. – *Michael Menduno*



Babble On Revisited

UPDATE When we last checked in with Klingon linguist d'Armond Speers ("Dejpu'bogh Hov rur qablji!" *Wired* 4.08, page 84), he had embarked on an ambitious project: to teach his toddler Alec to be bilingual in English and Klingon. Now that Alec's reached his fifth birthday, how's the effort going?

"I had a tremendously hard time talking to him about everyday things," Speers confesses. Klingon's vocabulary at the time was only about 2,000 words, and it lacked some crucial vocabulary, such as words for *bottle* and *diaper*.

So Speers found himself using "thing which is flat" for *table*. "Alec very rarely spoke

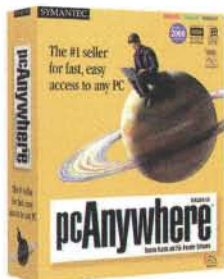
back to me in Klingon, although when he did, his pronunciation was excellent and he never confused English words with Klingon words," Speers says. "But we did sing Klingon songs together." (A RealAudio file of Alec singing is at www.bigfoot.com/~dspeers/klingon/resources.htm.) "Eventually he stopped listening to me when I spoke in Klingon. It was clear that he didn't enjoy it, and I didn't want to make it into a problem, so I switched to English about two years ago."

Too bad. Not long after Speers gave up, Klingon language architect Marc Okrand released *Klingon for the Galactic Traveler*, which included 1,000 new words, including one for *table*. – *Gavin Edwards*

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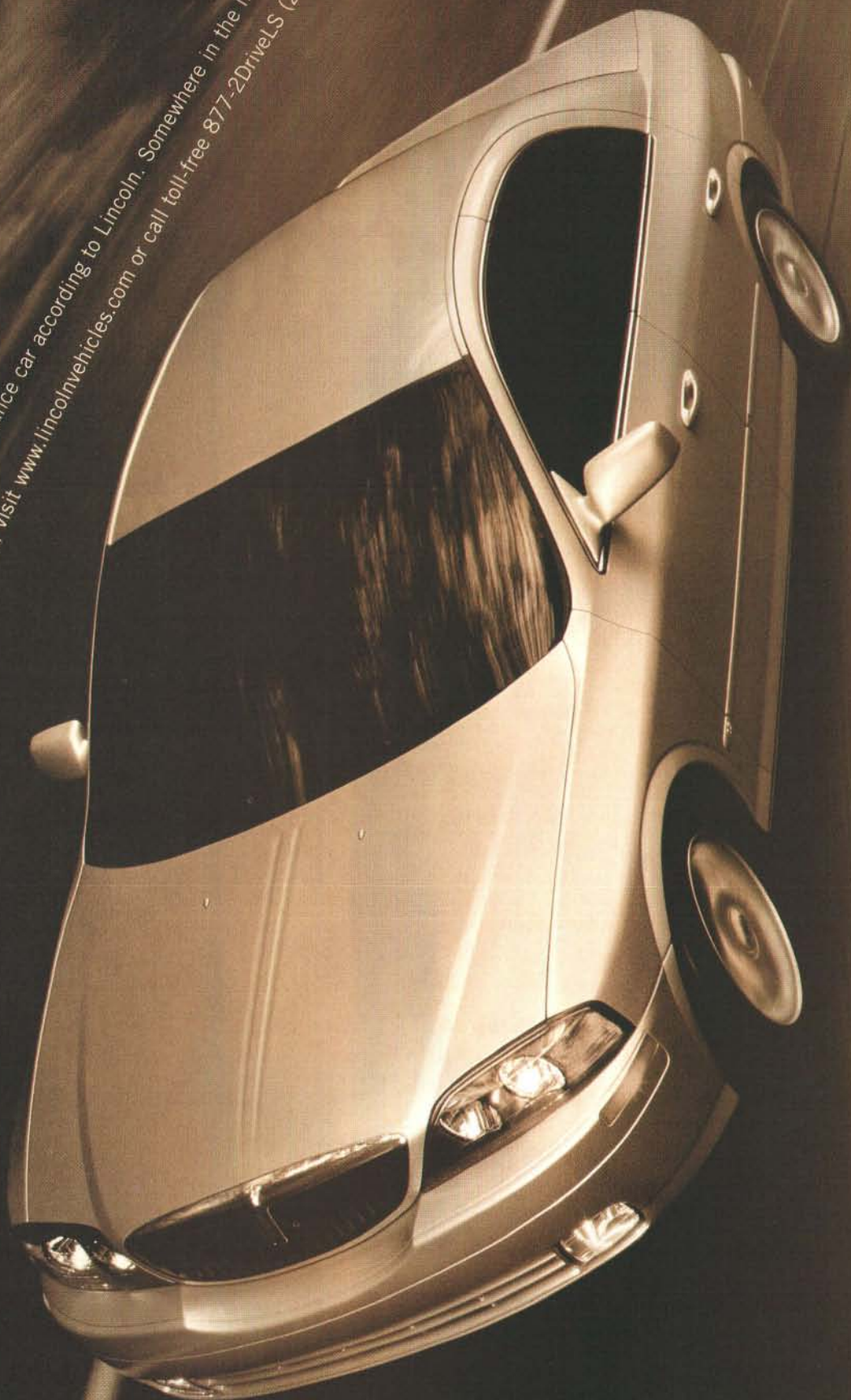
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WHAT A LUXURY CAR SHOULD BE

Associates) ▶ Only 19 percent of Italians have ever used the Net; more than half of Swedes have (Euroquest; BMRB International) ▶ Twenty-five percent of US households were online in



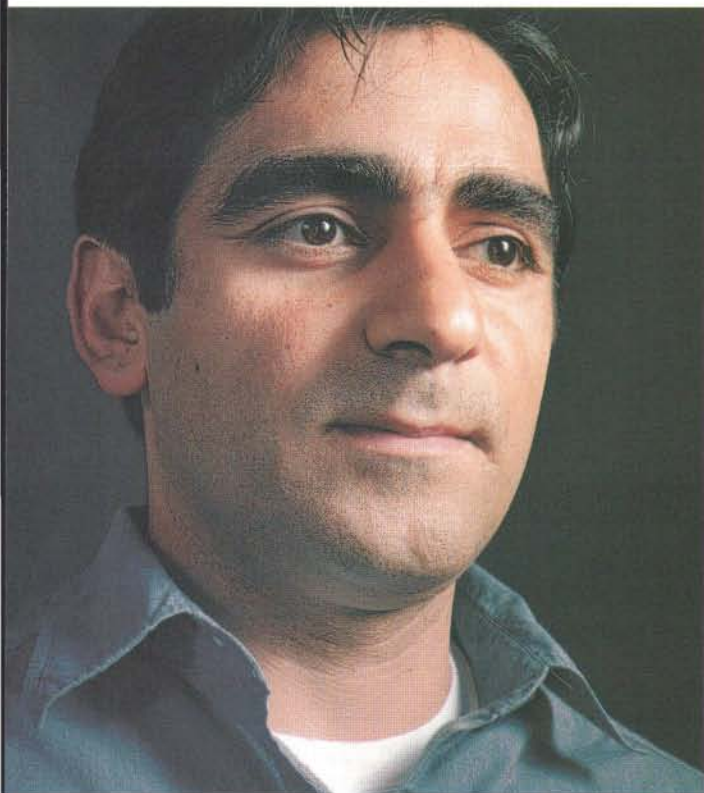
Philanthroseek

Infoseek founder **Steve Kirsch** proves that not all tech execs are skinflints when it comes to charity. Kirsch and his wife, Michele, run a foundation whose grantees range from the United Way to a group that scans the skies for killer asteroids. He also recently helped found Silicon Valley Social Venture, a philanthropy fund that he hopes will inspire high tech execs to open their wallets: "[Valley VIPs] think, 'I worked hard to make a lot of money. What's the point of giving it away?'" — *Evan Ratliff*

Steven and Michele Kirsch Foundation: software.infoseek.com/stk/charity/charity.htm

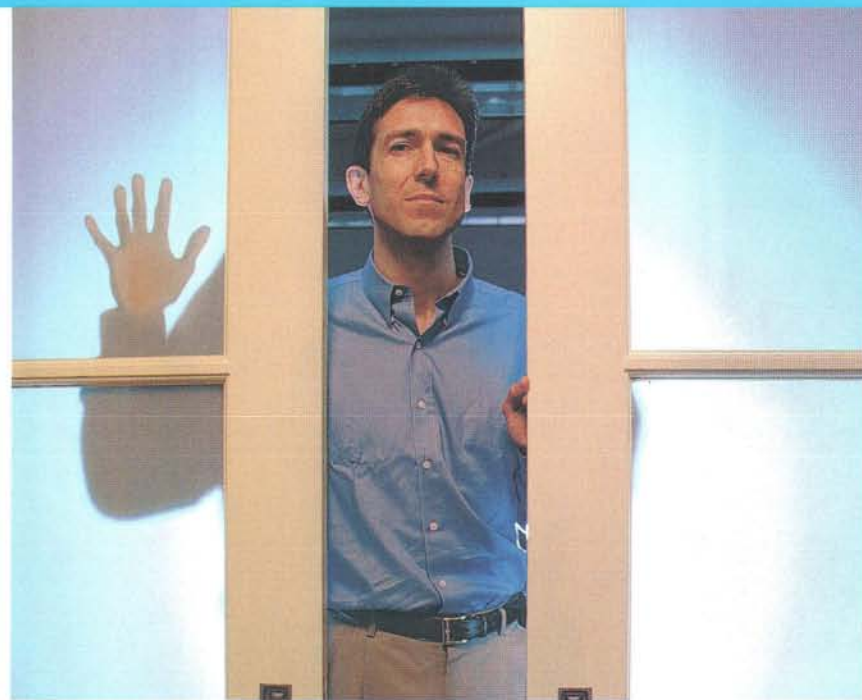
Prying Eyes

Once a scared 18-year-old fleeing the Khomeini regime in Iran, **Mahboud Zabetian** now heads AG Group, a network analysis company whose recently released software might seem to smack of the Ayatollah. WatchPoint, designed for companies that want demographic data on Web site users, lets marketers pry into packets traveling through any wire. But Zabetian's past has made him mindful of privacy. WatchPoint, for example, can't reconstruct email or track employees. "I'd rather have us develop this software than someone else," says Zabetian. — *Bob Parks*



Data Server

Even by geek standards, **Dina Bitton's** expertise — data warehousing — is giga-geeky. But being able to combine very large databases into efficient information repositories has become a must-have competitive edge, and Bitton's Integrated Data Systems is emerging as a player. IDS software helps users find the data they want when they want it — what a concept! — without having to duplicate, sort, or store redundant sets of data, the cause of most expense and waste. After launching two startups now run by others, Bitton sees IDS as her chance to prove herself as CEO. "This time," she says, "the vision is staying with me." — *Kaitlin Quistgaard*



Deja View

If **Tom Phillips** has that funny feeling he's been here before, it's because he has. The 43-year-old president and CEO of Deja.com (formerly Deja News) is drawing on past successes to revamp the venerable Usenet archive site, blending the sassiness of *Spy Magazine* (which he cofounded) with the technical elegance of Starwave's ESPN SportsZone and ABCNews.com Web sites (which he helped launch). Phillips added new capabilities to Deja.com that let users rate everything from laptops to radio personalities, and he wants to add more ecommerce elements. "By creating all this data, we can help people decide which cell phone to buy or which candidate to vote for," he says. "It's a power-to-the-people approach." — *Jessie Scanlon*

Urban Outfitter

When Sony asked former Disney Imagineering designer **Trevor Bryant** to create an urban entertainment center, the company gave him free rein to create a space to fit the name. Five years later, his answer is the \$85 million Metreon (www.metreon.com), which recently opened in San Francisco. The mall/multiplex holds 15 theaters (plus an Imax) and an adventure zone dominated by monstrous circuit panels (pictured). "I've got high expectations," Bryant says, "but what I really care about is what my kids think." — *Jennifer Hillner*



IMAGE: TIMOTHY ARCHIBALD

JARGON WATCH

Commco

Telcos attempting to create a "whole-house opportunity" for communications services, thereby blurring the distinctions among local and long distance carriers, ISPs, and cable providers.

Don't Have the Dongle

Phrase uttered by women when their ideas are not granted consideration equal to those offered by individuals equipped with outdoor plumbing.

GGs

Short for "genetic girls." Term used in the transgender community to refer to biological women.

Q2K

Rallying cry for supporters of Dan Quayle's bid for the Republican presidential nomination in 2000. (Is the link with a potentially crippling computer bug an unintended cry for help?)

Reputation Management

Euphemism du jour for "public relations."

Tip of the royal crown to Shari Durrell, Paul McFedries, Virginia Vitzthum, and Brenda Watkins.

— Gareth Branwyn
(jargon@wired.com)

Some Like It Hot

MANAGING Managers love to prattle on about teamwork and cooperation, but the truly effective groups, according to Jean Lipman-Blumen and Harold Leavitt, aren't the touchy-feely squads that managers talk about building. In fact, the authors write in *Hot Groups*, business leaders should cultivate and reward small, enterprising teams that are task obsessed and out for themselves. — Brad Wieners

What is a hot group? Is it just a sexy term for team?

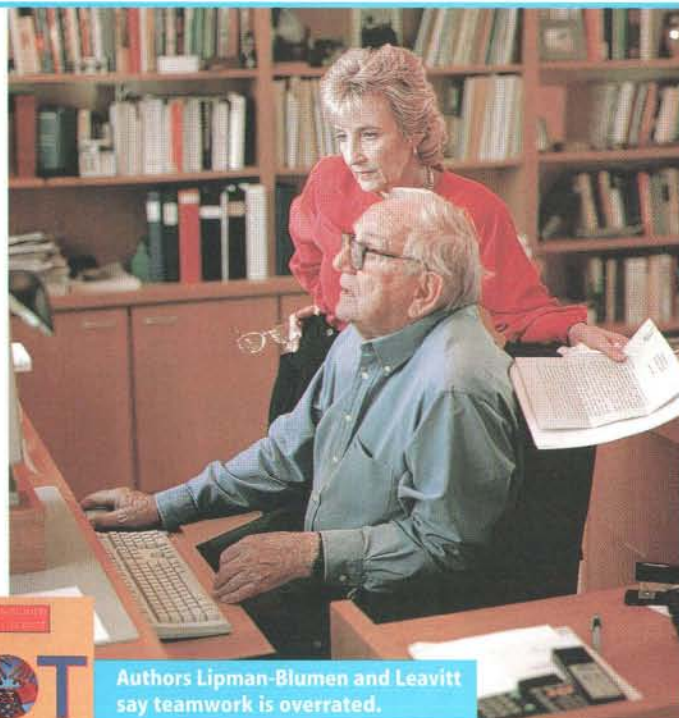
It is not a name, but a state of mind — that contagious single-mindedness and all-out dedication to doing something important. Hot groups are not appointed. They happen. The biggest thing is to recognize them and support them. Most organizations stamp them out because they don't conform to the bureaucracy or org chart.

What are the signs that a hot group is forming?

It's when people start doing things beyond what's required of them — that's one of the distinctions you see. In many teams, you'll see people looking carefully to make sure they aren't being asked to do any more than anyone else. In hot groups, people turn each other on. They do work on their own and bring it to the group — like intellectual gifts. Another thing they do is cheat. They'll use next year's resources for this year's project.

No offense, but hot groups don't seem very new.

Hot groups are not new, but they are right for today's hectic game of coping with volatile, mostly unpredictable, and lightning-fast change. The basic point of view of most organizational development people has been that if you want a group to function well, start out by developing



Authors Lipman-Blumen and Leavitt say teamwork is overrated.



trust and interpersonal understanding. Hot groups don't do it that way. They start with a task and work back to relationships. Very many hot groups will work like hell to finish a project and say good-bye to one another without hav-

ing developed any strong emotional bonds.

If I want to cultivate hot groups, where do I start?

Selection is the most important. Diversity is of great value. And forget about more on-the-job training — that's a great conformist tool. You need to change the climate. We ran into a middle manager at Intel and he told us about a dinner he held each quarter for the best failure of the quarter. That's great. The idea is to reward risk. You know soon enough if it's not going to work out.

MEATSPACE

The Runway

The Grand Bar at the Soho Grand Hotel has long been a place for high-cheekboned glitterati to see and be seen. But these days, it's not just models who are stepping out. Kate Moss frequents, but Miramax big man Harvey Weinstein, Sand Hill Road VCs, and ebusiness execs also strut their stuff in the bar's center aisle, dubbed "the runway." With a nod to the hotel's gritty neighborhood, designer William Sofield styled the interior in industrial hip: steel wainscoting and a staircase studded with glass bottles. Large mirrors conveniently allow you to eye the competition while sipping a drink. So why are the techies rubbing padded shoulders with the beautiful people? "They're having their 15 minutes of fame," says hotel concierge Bryan Devlin. "Everybody needs to feel it once." — Jennifer Hillner
Soho Grand Hotel: 310 West Broadway at Grand Street, New York City. +1 (212) 965 3000, www.sohogrand.com.



IMAGES FROM TOP: CARLOS SERRAO; MICHAEL SCHEIMAN

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Clenched butt cheeks • constant low-grade ambient fear • euphoria • the shakes • working the word "crampion" into every conversation • unemployment • hyperactive adrenal gland • fondness for really tight, stretchy fabrics • mild dyspepsia • heart palpitations • deep appreciation for rope • excitability • forgetfulness • failed relationships • insomnia • horripilation • increased heart rate • increased sex appeal • shortness of breath • bulous eruption • nervousness • forgetfulness • dizziness • ironic simultaneous hypersensitivity to and craving for eggs • increased salivation • nausea • chills • twitching • scurvy • sore joints • increased sweating • nasty paper cut • itchy skin • hair where there wasn't hair before • no hair where there once was hair • forgetfulness • halitosis • amnesia • spasms • tongue gets stuck in desk drawer • that gassy and bloated feeling • delusions of grandeur • fondness for wearing a safety harness • forgetfulness • potbelly • torn earlobe • temporary loss of bladder control • abnormal thinking • incomprehensible babbling • comprehensible babbling • anxiety • smelly pants • forgetfulness • bulging eyeballs • the yucks • attention deficit disorder • sleep disorder • non-specific offensive odor • agitation • hot flashes • cat scratch fever • spring fever • weak knees • forgetfulness • hyperventilation • rug burn • Indian burn • cooties noogies • wedgies • leeches • jeebies • bloodshot eyes • achiness • breakiness • shakiness • cauliflower ear • hangnail • calluses • blisters • goul • the frizzies • morning breath • the munchies • foot odor • normal to oily skin • sniffling • sneezing • coughing stuffy-head-so-you-can't-rest • fine lines and wrinkles • bags under eyes • fear of snapping a femur • wheezing • sweaty palms • hairy palms • hairy tongue • studliness • forgetfulness • spastic colon. (Please see Quokka.com billboards for complete list of side effects.)

What is Quokka.com?

Quokka.com is 24-hour live sports coverage that uses proprietary digital technologies to let you experience what the athletes experience. Combined, these technologies deliver a powerful new form of sports entertainment called Quokka Sports Immersion.™

Quokka.com live climbing expeditions and events:

Great Trango Tower—Three top climbers, including Alex Lowe, travel to Pakistan to attempt the first ascent of the Tower's Northwest Face—a mile-high, vertical rock wall. Spending 30 days on the wall itself, the team will relay live audio, photos, 3-D maps, firsthand reports and biometric data.

First Ascent—A team of professional climbers scales the unconquered peaks of the Karakoram range in China. Quokka Sports delivers continuously updated live coverage—audio direct from the mountain, digital photos, climber e-mails, weather reports and global positioning data.

CART Champ Car Racing—The fastest circuit racers in the world. Quokka Sports provides complete, immersive coverage of races throughout the season with a real-time race viewer, behind-the-scenes reporting, standings, statistics and live audio from the cockpit.

Users may also experience these archived events:

Marathon des Sables—Runners test the limits of human endurance in this 150-mile foot race across the Sahara desert.

Around Alone—Sailing's ultimate challenge and the longest race for an individual in any sport. One person, on a boat, around the world, alone.

The Whitbread—Yacht racing's most grueling competition. A 32,000-mile odyssey.

A 16-month efficacy trial involving users 18-49 years of age reports a high response of "This is freaking incredible" from our randomly selected trial participants. A smaller group responded with barely audible chirping noises. One participant simply crawled into the fetal position under the table, where he remains to this very day.

What is Quokka Sports Immersion?™

QSI is the active ingredient in Quokka.com. It is a revolutionary way to follow sports, combining live video and audio, still images, continuous 24-hour updates, e-mail diaries from the competitors, biometric data, professional commentary, real-time statistics, event maps, background information and athlete bios. Studies show Quokka Sports Immersion provides the most intense sports coverage available today. Studies of these previous studies confirm the results of two earlier studies. A 22-month study of these 12-month studies demonstrates that 14-month studies based on previous 8-month studies are basically a load of crap. All studies conclude that further studies will be necessary.

What if I become pregnant while using Quokka.com?

It is unlikely that you will get pregnant while simultaneously using Quokka.com because of the highly engaging spectator experience Quokka Sports Immersion provides. However, if pregnancy does occur, you should refrain from giving your baby the following names: Crampon, Blister, Piston, Barnacle, Gaping Wound, Hypoxia, Matey, Tapwater, Cockpit, Sidecar, Musty Sail Bag.

What the **** do you mean, side effects?!

Users may experience severe side effects as a result of their complete immersion in the drama and excitement of the sports event. Due caution should therefore be exercised when using Quokka.com while operating the following potentially dangerous machinery: lawnmowers, single-engine aircraft, 80-story cranes, monster trucks, elaborate lever-and-pulley systems, acetylene torches, invisible death rays, visible death rays, lunar landing modules, levitating bullet trains, tanning beds, nuclear submarines, 40-ton hydraulic presses, forklifts or toaster ovens.

Who can I sue if I'm injured by Quokka.com?

Because Quokka collapses the distance between you and the sports event, you experience what the athletes experience (see table 1). Consequently, there is a small probability (<.0001%) you will become injured as a result of your immersive experience. There is also a small probability (<.000001%) you will co-star in a sitcom about a talking goat detective. Quokka.com, Quokka Sports, its parent company or any of its subsidiaries accept no responsibility for any injuries, real, imagined or otherwise, sustained while using Quokka.com. If, however, you sustain injuries while co-starring in a sitcom about a talking goat detective, feel free to sue anyone you want to.

Table 1. The Incidence of Unsolicited Adverse Events (Including Severe Events) Reported by Quokka Athletes in a Double-Blind, Placebo-Controlled Trial.

Adverse Events	Quokka.com	Placebo (sugar pill)
Avalanche	23%	0%
Gale-force winds	62%	0%
Uncontrollable sobbing	44%	9%
Teeth fall out of head	1%	83%
Hit wall at 200 mph	17%	0%
Laceration	99%	6%
Fall into crevasse	12%	0%
Spontaneous decapitation	0%	2%
40-ft. waves	39%	0%
Struck by runaway grand piano	0%	31%

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Dream On

UNDER THE HOOD
BY DAVID PESCOVITZ

The \$7.1 billion videogame console battle moves to another

level with the September 9 US release of Sega's Dreamcast. Boasting a 1-Gbyte CD-ROM drive and a graphics engine that cranks out 3-D images four times faster than a Pentium II, Dreamcast is playing tough.

But console heavyweights Sony PlayStation and Nintendo 64, commanding 96 percent of the US market between them, aren't exactly throwing in the joystick.

Gamers are already itching for Sony's late-2000 release of PlayStation 2, which the Tokyo Godzilla claims will render polygons 20 times faster than Dreamcast can. And Nintendo is

gearing up for its next-generation console, code-named Dolphin. Based on a 400-MHz PowerPC chip that outruns the PlayStation 2, Dolphin may also play DVD movies.

Sega's biggest advantage is timing. For at least 14 months, its \$199 Dreamcast will deliver the speediest consumer gaming hardware on the planet.

DREAMCAST CONSOLE



The **serial port** is comparable to the standard computer RS-232 interface. It could support a range of devices, including a printer.

The **audio-visual port** outputs both an NTSC signal for TV sets and a VGA signal for high-res PC monitors.

Dreamcast's fast, detailed graphics come courtesy of a **PowerVR 2DC chip**, custom designed by NEC and VideoLogic. At its peak, the PowerVR 2DC can crank out 3.5 million polygons per second, 10 times more than any of today's game consoles.

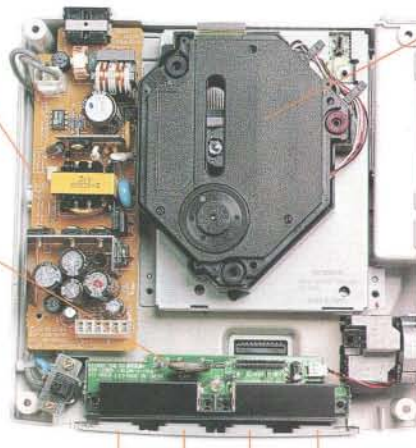
Sixteen Mbytes of RAM act as the CPU memory.

The brain of the beast is a 200-MHz **Hitachi SH-4 RISC chip**. This CPU is tricked out with four floating-point multipliers for blazing graphics calculations.

INSIDE, TOP LAYER

The **power supply circuitry** controls the juice that flows from the wall into the Dreamcast.

The **lithium battery** powers 128 Kbytes of RAM to store game preferences, even when the machine is turned off.



The **Yamaha 12X CD-ROM drive** can play discs that store up to a gigabyte.

Four control ports feed data at 2 Mbps from game controllers, including joysticks, joypads, and keyboards.

INSIDE, BOTTOM LAYER



A **Yamaha Audio Engine** provides 64 channels of digital audio for 3-D sound effects.

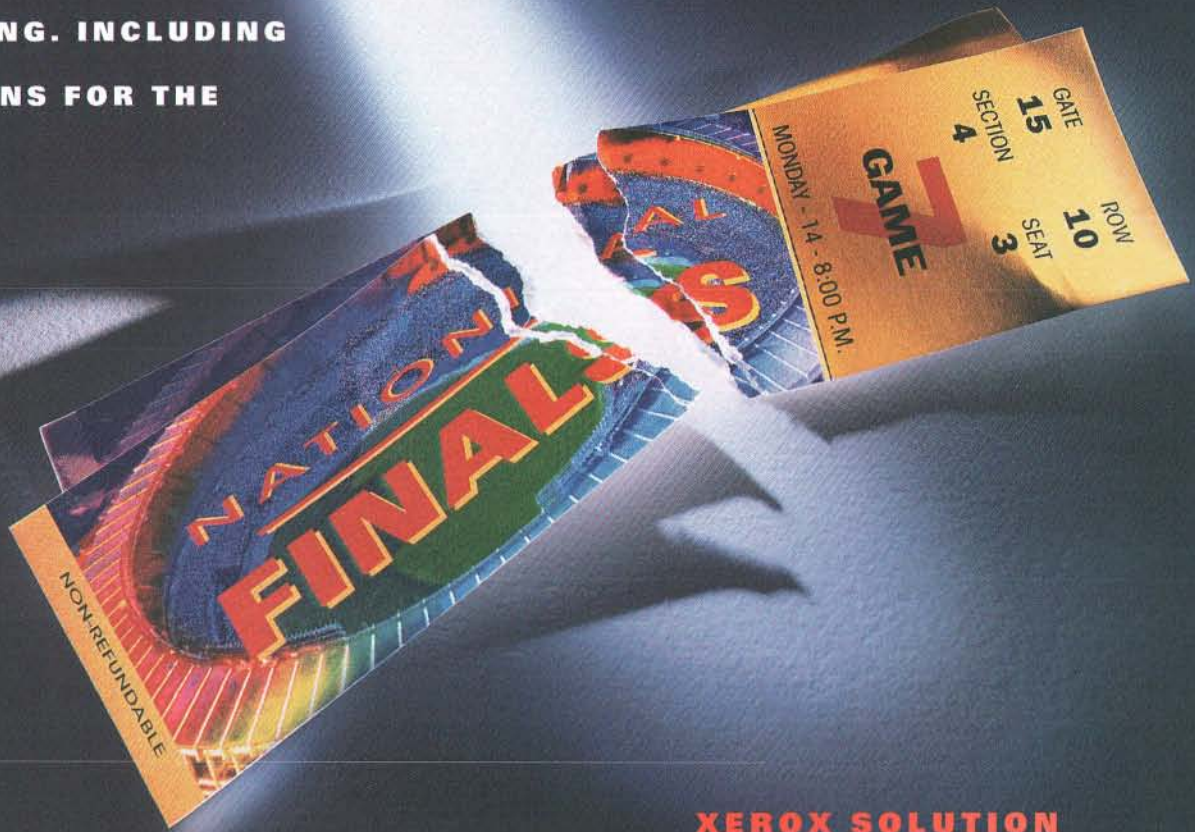
Two Mbytes of audio RAM store the game's sound data.

The **S6K modem** slides in and out of a high-bandwidth port, enabling future upgrades, such as cable modems.

Eight Mbytes of video RAM store data to seamlessly update graphics.

Variable-speed fan keeps everything cool during those 8-hour *Virtua Fighter 3* marathons.

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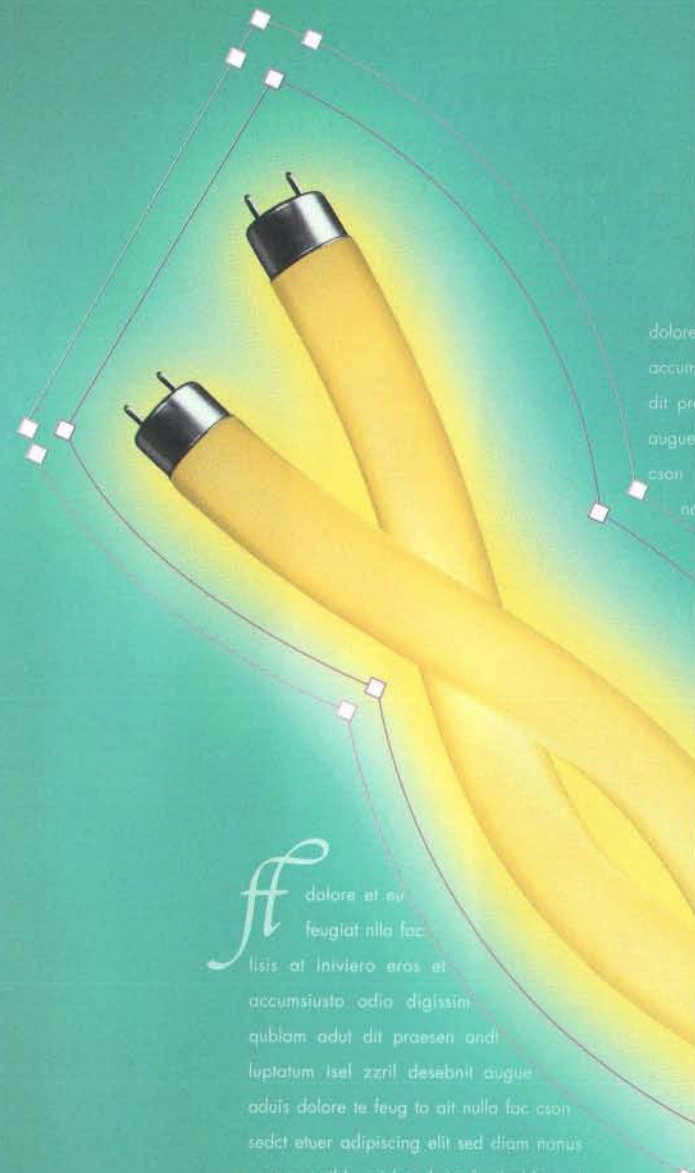
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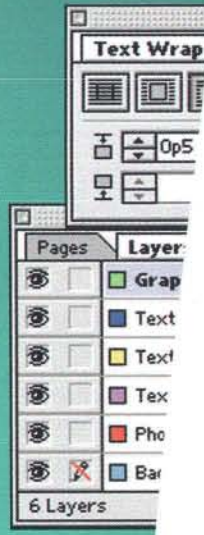
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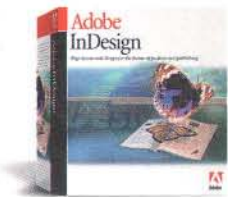
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James Gleick's Survival Lessons

The author of *Chaos* confronts personal tragedy and the meaning of time.
By David Diamond

James Gleick is one of America's most popular and lucid science writers, author of the best-sellers *Chaos* and *Genius* and of the forthcoming *Faster*, a widely anticipated look at technology's hurry-up impact on modern life. He's not too keen on face-to-face communications, though, and when I first email him to ask for an interview, his replies are evasive. He is still recuperating from a long hospital stay, he writes back; he is busy writing a book: "With few interruptions, I hope, for the rest of the year, and my point is that this isn't a colorful, two-person activity."

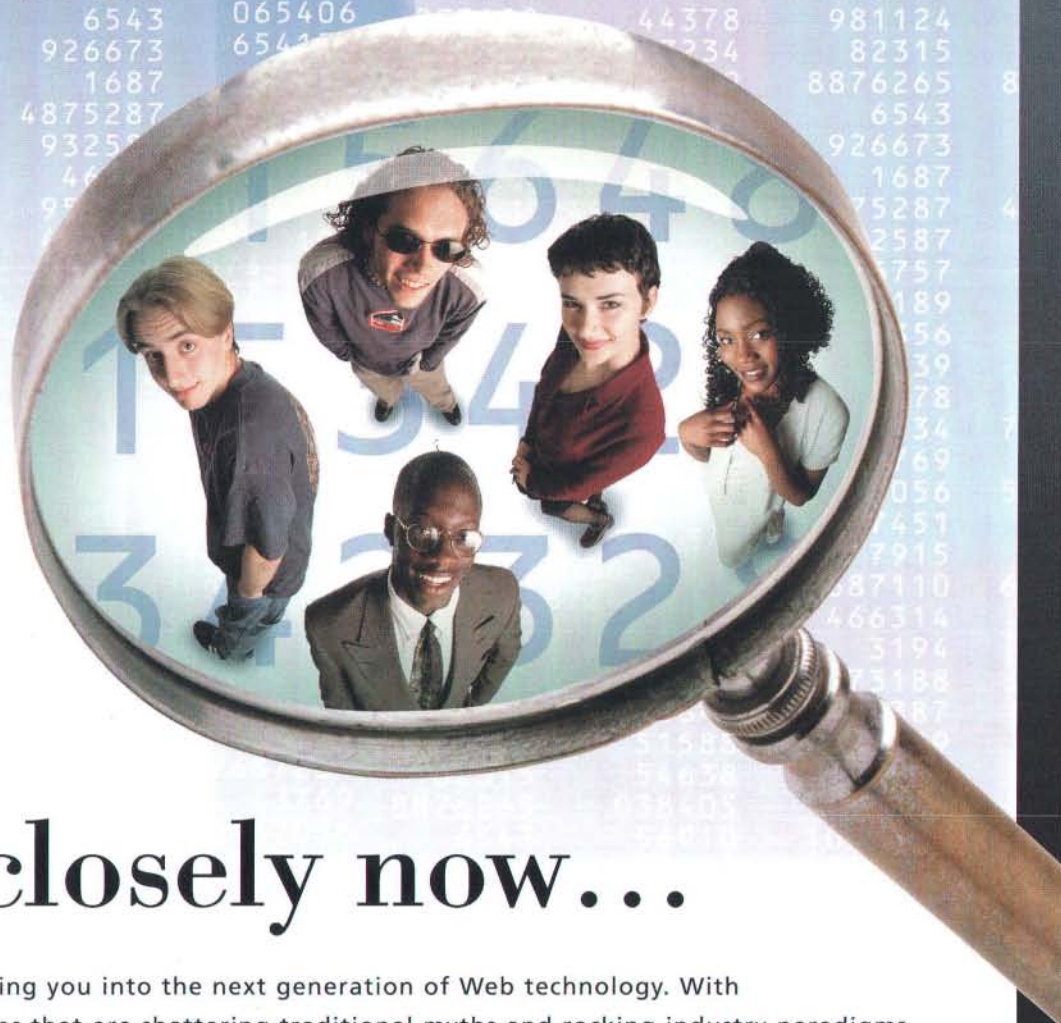
Yet, if I insist, I can see him at his place in the country. "You are welcome to . . . come visit briefly," he writes. The words don't quite convey the sound of a door slamming. Yes, it looks closed. But I sense Gleick on the other side, his hand on the knob, waiting to see if I will go away.

I drive out for the first time in August 1998. Gleick and his wife, Cynthia Crossen, are living full-time in the country now, about an hour north of New York City.

The road up to their home is long, winding, and rich with the smell of late-summer leaves. "Climb boldly to the top," Gleick had instructed. "Stay wide on the turns."

The house is a stunning Frank Lloyd Wright-inspired sprawl of granite and cedar, perched high above the river in Putnam County, a woodsy domain on the Hudson's east bank. Landscapers are laying sod when I pull up, and Gleick's black Lab, Astro, rises from the lawn. A young Swedish woman named Frida, an occupational-therapy student who's helping Gleick recuperate, pulls open a newly varnished wood-and-glass door.

Gleick at his new apartment in Manhattan, May 1999.



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Gleick stands in the living room, leaning on crutches. In a picture on his Web site you see a strikingly handsome man in his mid-forties, his light brown hair slightly unkempt, his ruggedly planed face brought to life by eyes filled with inquiry. In person his face is softer. He is 6 feet tall and wears a faded brown polo shirt, cotton shorts, and boots. The shorts reveal a prosthetic left leg and a heavily scarred right leg.

Gleick limps slowly out to a deck and settles into a lounge chair. He doesn't quite get why I'm here, he begins, why he merits attention "at this point in time."

The minor-key grouchiness is no surprise. Among colleagues, Gleick is widely respected but not exactly beloved. People describe him as everything from "curt" to "Machiavellian," noting that he can be gruff with people who aren't up to speed intellectually. It's a reputation he's willing to play with. At one point, we talk about Freeman Dyson, a brilliant physicist whom Gleick has written about.

"He seems like a truly sweet person," I say.

"He *is* a sweet person," says Gleick, smiling at the thought.

"Well, heck. You're sweet, too."

"No, I'm not," he says. "I'm a complete asshole."

Crossen joins us later for lunch. A longtime *Wall Street Journal* writer and editor, she is spirited and friendly, telling me how she met Gleick his first year out of Harvard, in 1977, when he was managing editor at a short-lived alternative newspaper in Minneapolis and Crossen was a young staffer on her first job. "I slept with the boss," she laughs, fetching food from the refrigerator.

With Crossen around, Gleick relaxes – sort of. At one point, as they swap memories and compliments, he mentions Crossen's 1995 book, *Tainted Truth*, an examination of how statistics can be used to distort reality.

"This is an excellent book," he says, suddenly revved up, declaring that it should be read by every editor in the country. "It got favorable reviews everywhere except *The New York Times Book Review*, which assigned it to some stupid moron of a . . ." He stops himself. "I'm not supposed to criticize anybody."

Crossen stands to leave, her back to a wall of family photographs – parents at a cele-

bratory gathering, Jim carrying a child in a backpack. She begins talking about Gleick's early days as a staffer at *The New York Times*, when he was writing brief items called "Follow Up on the News."

"They don't do that section anymore," she says, speaking quickly. "The one I remember was about the people who had been on a Northwest flight – one of those deals where a plane dropped 20,000 feet. And they all think they're going to die, and it rights itself and so nobody even gets injured. But it was like 10 seconds of unbelievable terror, and these people said it changed their lives."

"I don't remember that one," says Gleick. "Must have blocked it out. Want to go up and see my office?"

On the morning of December 20, 1997, Gleick was piloting an experimental airplane when it crashed 60 feet short of the runway at Greenwood Lake Airport in West Milford, New Jersey. The couple's adopted son, Harry, a lively and adventurous 8-year-old who often flew with his father, died shortly after impact. Gleick was trapped inside the mangled aircraft for half an hour;

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as rescue workers started pulling him from the wreckage, he asked about Harry and then passed out. Gleick lost a leg, nearly lost both, and spent five months in New York University's Rusk Institute of Rehabilitation Medicine.

Gleick had started flying back in the late '80s, when he was a copy editor at the *Times*. Working the weekend shift, he had an out-of-sync schedule that allowed him to take midweek lessons. Aviation appealed to both the adventurous and technogeek sides of his personality.

"Flying was great," he says. "You have to think fast. You have to develop intuition about the physics of air moving quickly over a surface. And I can say, much to my sorrow, that you're using your hands and feet on the controls of this thing, and you feel it. Then there's all this other stuff you have to learn, the radio stuff and the navigational stuff."

Gleick had "this crazy idea to buy a secondhand, home-built airplane," so in August 1997 he purchased an 11-year-old Long-EZ, a \$35,000 aircraft put together from a kit. The plane has a composite fiberglass/foam body, a Canard wing configuration (with small wings in front and larger

lift-producing wings in back), and a rear-mounted engine. The Federal Aviation Administration classifies the Long-EZ as "experimental" - meaning, among other things, that the FAA has limited regulatory control over it - but the craft has a reputation for reliability and is often used to gather data for government research.

Of course, reliability is a relative term

certifies them for airworthiness. Still, these are tricky aircraft. Gleick's plane was the same make as the one John Denver died in, and like all experimental pilots, Gleick was required to affix a placard on his plane that read: PASSENGER WARNING: THIS AIRCRAFT IS AMATEUR BUILT AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR AIRCRAFT.

After the accident, the New York media world buzzed: Was flying a kit-built plane really the wisest father-son hobby?

with these planes. According to the Experimental Aircraft Association, .76 percent of all amateur-built planes are involved in an accident at some point - everything from a wing catching on a hangar door to a fatality. That's higher than the rate for small private planes and higher still than the rate for commercial airliners.

The FAA does not oversee the design of experimental planes, but it does inspect every stage of their construction and

The cause of the accident is still a mystery. The final report of the National Transportation Safety Board is due this summer, and at press time both mechanical and pilot error remained possibilities. Gleick could be exonerated, or, though it's unlikely, he might face criminal charges if it's determined that an act of gross negligence caused the accident.

After the crash, some people in the close-knit world of New York media saw no need to wait on reports. The very nature of the

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episode seemed blameworthy enough, and a fundamental question became the buzz du jour: Was flying around in a kit-built plane really the wisest father-son hobby?

At Harry's memorial service, with Gleick still in the hospital attached to a morphine IV, Crossen chose to address that head-on, recalling how Harry loved to fly, how meticulous Jim had been about maintenance, and how, in her mind, risk-taking was integral to enjoying life. As for this risk, she said she

Harry on his lap, played hours of computer games like *Doom* and *Total Annihilation*.

"I didn't think I could do it," he says of his decision not to go back. Instead, Gleick and Crossen moved into the weekend retreat they were already building in Putnam County.

"This wouldn't have been a place to live full-time," he says, his voice starting to crack. "Our house is great if you want to be alone in the woods. It's lousy if you're a 9-year-old. Go play with your friends? Forget

This time Gleick is in khakis. "I thought we'd go for a drive," he says, smiling.

As we amble down to the car, I see that though Gleick still limps, his walking is much improved. His new prosthesis has a hydraulic knee that gives him better mobility. His spirits are better, too. His book is almost finished and his doctors have told him that, eventually, he could be walking with only a minor limp, though no one knows for sure.

We drive along the Hudson in the new car, with Gleick showing off its dashboard GPS. The screen displays a blinking light to indicate where Gleick should turn to stay on the course he's punched in. He ignores it

Young Gleick was quick to show his intelligence – and to ding those he thought "intellectually shabby."

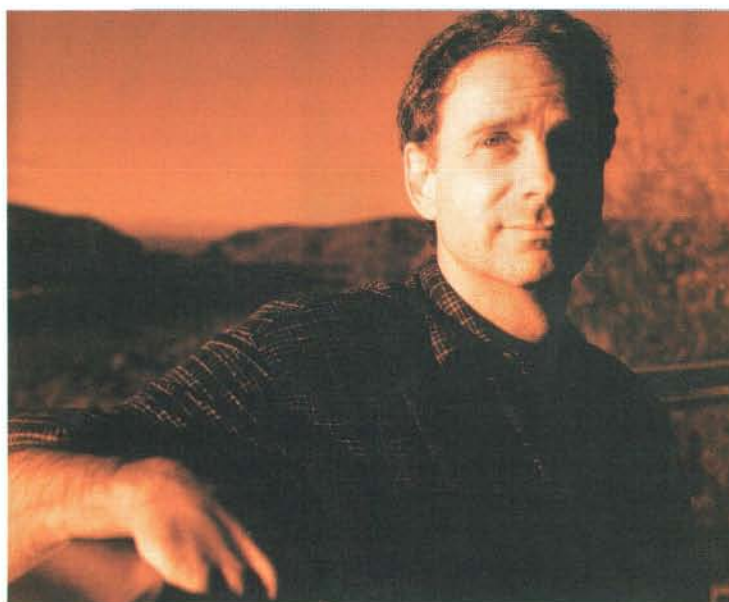
and Jim "would live with the consequences of that decision for the rest of our lives."

For his part, Gleick mixed grief and recovery – he literally had to learn to walk again – with a rapid return to work. Shortly after the accident, Jack Rosenthal, then editor in chief of *The New York Times Magazine* and perhaps Gleick's biggest fan there, phoned Crossen to offer his sympathy. She suggested he send Gleick an email; in the ensuing weeks and months, Gleick communicated electronically with Rosenthal, who figured that "work could be a big part of bringing Jim back."

"Spend five months in a hospital and you find out who your friends are," says Gleick, recalling people who reached out to him during those dark days. Rosenthal made regular visits, and in February 1998 he suggested it was time for Gleick to resume his popular monthly technology column, "Fast Forward." From his hospital room, Gleick produced a piece on digital storage, which appeared in April.

Sometimes he talked to Rosenthal about losing concentration, saying that he had "spent the whole day thinking about Harry." He also found that a 5- or 10-minute walk produced nearly unbearable pain. Still, he welcomed the chance to work.

Gleick never returned to the family's permanent home in Brooklyn Heights, where he had written his first two books and, with



Gleick at home in upstate New York. Asked how the crash changed his perception of time, he says, "Too soon to tell."

and talks about the book, which originally was Crossen's idea.

"I'm trying to look at many, many things in modern life that I believe are going faster, and I'm trying to look at why they're going faster and what effect they have on us," he says. "We all know about FedEx and instant pudding, but it doesn't mean we've looked at all the consequences of our desire for speed."

As a boy and a young man,

Gleick was certainly in a rush, approaching life with relentless applications of energy and curiosity. His father was a prosperous lawyer in Manhattan; his mother was a newsletter editor who, among other things, campaigned for Eugene McCarthy and wrote a children's book explaining the concept of time. It was obvious early on that Jim was unusually intelligent. His younger sister, Betsy Gleick, a *Time* writer based in London, recalls how family lore had it that he was reading at age 2 or 3. "The talk was always about how brilliant he was," she says, "how brilliant and incredibly focused."

Gleick attended Riverdale Country School, where JFK once studied, and excelled in mathematics and science. But at Harvard in 1972, he realized he didn't have what it takes to be a first-rate mathematician. (He sat in on an advanced math class and felt about it. Whereas Brooklyn Heights was just a great place for a young boy. He could run out and go visit his pals next door."

In the months after my first visit, Gleick endures a twice-weekly physical therapy regimen and untold hours on the treadmill; he plays bridge online and in an occasional tournament with a few close friends. In the parking lot of a nearby shopping center, he learns to drive his new dark-green Lexus GS-400, which has built-in GPS, and discovers the cultural limitations of an adult living in the woods. "The movies I'm reading about in *The New York Times* are not available at the local malls," he gripes.

In November I pay another visit. The Hudson Valley is a quilt of orange, red, and yellow; maple, oak, and sycamore leaves shimmer in the brilliant autumn sunshine.

Gleick attended Riverdale Country School, where JFK once studied, and excelled in mathematics and science. But at Harvard in 1972, he realized he didn't have what it takes to be a first-rate mathematician. (He sat in on an advanced math class and felt

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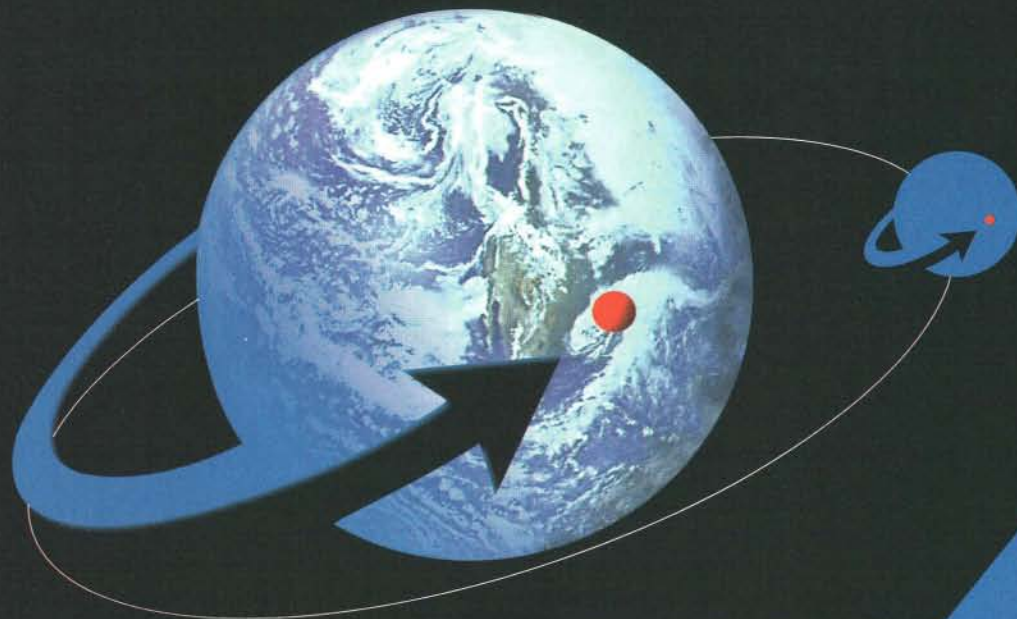
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“clueless.”) So he majored in English and linguistics and shopped for a passion. He found a home at *The Harvard Crimson* and decided to pursue journalism. One memorable contribution: a scathing review of a lecture series by Leonard Bernstein connecting music to linguistics. Gleick dinged the lectures as “intellectually shabby.”

Gleick joined the *Times* after his stint at the failed alternative newspaper in Minneapolis, worked his way up for a few years, and was eventually named assistant Metro editor. He maintained an abiding interest in science, and his first contribution to the *Times Magazine*, in 1983, was a cover story on Douglas Hofstadter, the mathematician-linguist who’d written the book *Gödel, Escher, Bach*. Soon enough, Gleick found a place in the pages of the weekly Science Times section, where he honed his ability to convert complex swaths of science and technology into readable narratives.

Gleick detected a common theme running through many of his subjects: a search for patterns in seemingly random events and structures that was at the theoretical core of chaos theory. The more he learned about chaos, the more interested he became. “The basic lessons of science were not necessarily connected to stuff that we care about, but it struck me that that wasn’t true of chaos,” he says. “Chaos was a science that was uniting all kinds of disciplines.”

He wrote a magazine article about scientists studying the nonlinear behavior of systems – people like Edward Lorenz, who determined by accident that minuscule inputs could have huge, complex outputs, far from the source. Book publishers came calling, and Gleick took a four-month leave of absence to report *Chaos: Making a New Science*. He wrote mornings, evenings, and weekends for two years. Published in 1987, *Chaos* exploded onto best-seller lists and touched off a minor conflagration among chaos scientists, who had mixed reactions to their new high profile.

“Gleick’s book changed the whole field,” says J. Doyne Farmer, who as a member of the “Chaos Cabal” at UC Santa Cruz was one of the book’s stars. “People started to take themselves too seriously. Those who were left out got pissed off at those who weren’t. Things got ugly.”

Murray Gell-Mann, a Nobel Prize-winning

physicist who taught chaos at Caltech in the ’80s, complains that Gleick’s book “exaggerated the importance” of the subject. Gell-Mann was mentioned in the book, but he has a dim view of journalists who popularize scientific research, taking pains to point out that the French word for “to popularize” is *vulgariser*.

“I think it’s best when scientists do their own work, as I did in my own book, *The Quark and the Jaguar*,” he says. “It used to be the standard thing for scientists to write their own books. If I’m not mistaken, it became unfashionable for many years and now it has come back in fashion. I like that.”

Chaos earned Gleick a seven-figure, two-book advance and his freedom as a writer. His next project took on the complex, entertaining life of Richard Feynman, the Manhattan Project veteran, legendary Caltech faculty member, and Nobel Prize winner who essentially rewrote the understanding of quantum electrodynamics. Gleick’s 1992 book, *Genius: The Life and Science of Richard Feynman*, was another hit.

Barely taking a breather during the months of marathon writing sessions on *Genius*, Gleick also found time to become one of the earliest Internet pioneers. He liked to break up his day by indulging in videogames and online bridge. One problem with virtual bridge, circa 1992, was the exasperating state of Net access – you got a Unix shell account, and you had to type in tangles of arcane commands to get on the Net. Gleick figured he could do better. He approached Uday Ivatury, a programmer he knew from the Manhattan Bridge Club, about the prospects of joining forces in a business. Ivatury had never read Gleick’s books (he still hasn’t), but he liked Gleick’s mind and agreed to a partnership.

In November 1993, after months of intense work, Gleick and Ivatury launched the Pipeline. Its major advance was a graphical user-friendliness that to some extent anticipated what was coming on the World Wide Web. It was an immediate success. The customer base doubled in each of the first six months, and the company licensed its core software to independent and corporate service providers. Fourteen months after the launch, the Pipeline was purchased by PSINet, the Herndon, Virginia-based ISP;



spycam?

cyclops?

hovercraft?

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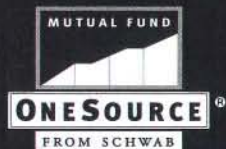
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PSINet bought it for \$10 million in stock, a small fortune that multiplied when PSINet went public a few months later. Gleick got a bit more than half the payoff; his share value increased to about \$15 million at the IPO and later rose as high as \$28 million.

After the big windfall, Gleick returned to writing, in a new column for the *Times Magazine* suggested by Rosenthal. During its four-year run, "Fast Forward" critically evaluated the limitations and frustrations of technology, and the scramble to define its future. One of Gleick's favorite themes was that technology charts its own course – the

Microsoft then had a 13 percent interest.

Edstrom denies that there was an organized campaign to swat Gleick, but Gleick says Bill Gates himself unapologetically confirmed the story. "A year later, at a face-to-face meeting at a Stewart Alsop conference, I confronted him," says Gleick. "I said, 'How come your PR people did this whispering campaign about me?' He said there was no whispering campaign. He said, 'There was something about you we thought people should know.'" Gates also said, according to Gleick, "I could show you the list" of reporters who were contacted.

Forget false nostalgia for the slow life, says Gleick, but expect to have "trouble coping with the consequences."

Net being the prime example.

Gleick made a few bum calls from his pulpit, as when he called AOL a dinosaur in 1994. ("I must concede that, for a dinosaur, Steve Case has done very well," he says now.) More often, he was on target, as with his column on push, the darling technology (and *Wired* cover subject) of late 1996 and early 1997. "The promotion of Push is the silliest piece of puffery to waft along in several seasons," Gleick wrote in March 1997, calling its failure "preordained."

But perhaps his most important piece in this period was a 1995 cover story called "Making Microsoft Safe for Capitalism." The US Justice Department had already brought and settled its initial antitrust action against Microsoft, but Gleick was among the first big-name journalists to perceive that the antitrust issue was still unresolved, and that it was getting more serious with each passing day. "[Microsoft] does possess and covet monopolies, despite vehement denials from its lawyers," Gleick wrote. Its goal: to determine "the standards and architectures that control the design of modern software."

Microsoft was upset by the piece, and the company's PR bigfoot, Pam Edstrom of Waggenger Edstrom, quickly started calling reporters – the *Times*' John Markoff among them – to suggest that Gleick had a blatant conflict of interest. After all, he still owned a lucrative stake in PSINet, a direct competitor of UUNet, a network firm in which

"He wasn't even ashamed of it," says Gleick. "It is not the way things are now, where he's trying to emphasize that he's not a hands-on guy."

Set for publication in September, *Faster: The Acceleration of Just About Everything* begins and ends in the office of Gernot M. R. Winkler, the director of the Directorate of Time, at the US Naval Observatory in Washington, DC. In the opening pages, Gleick explains the elaborate process by which true time is established. A master clock consults with clocks all over the world via satellite; their output is statistically merged at the Bureau International des Poids et Mesures, outside Paris.

By the end he has offered a maddeningly fascinating perspective: Time can be measured, but never contained.

"Come to think of it, Winkler is not really setting the pace – not for you," Gleick writes. "Synchronize your watch according to his clocks, sure, but you will serve as your own director of your own time directorate. You will remember that time is defined, analyzed, measured, and even constructed by humans. It may help to think of time as a continuous flow, rather than a series of segmented packages. Or to find aggressive ways of squandering the time you save.

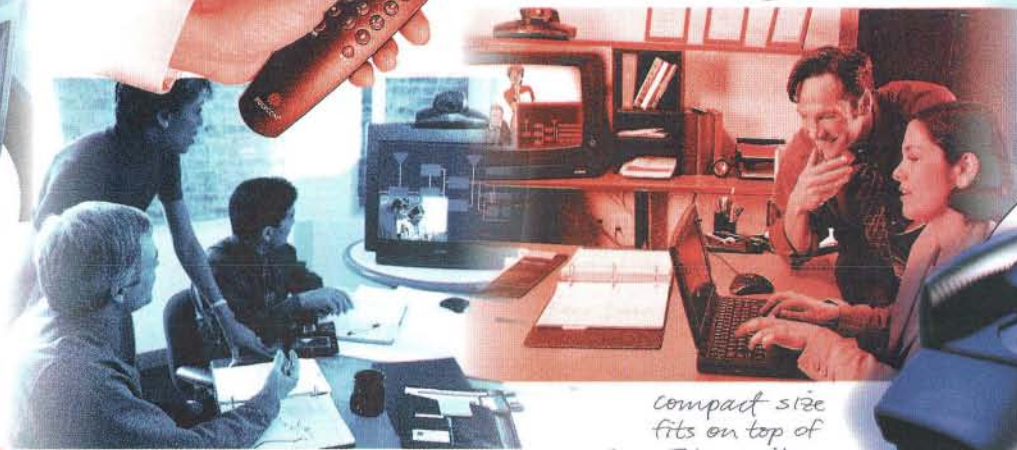
"Or at least to recognize," he concludes, "that neither technology nor efficiency can acquire more time for you, because time is

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not a thing you have lost. It is not a thing you ever had."

Gleick portrays a world whose inhabitants are caught up in a whirl of mass adjustment. Peter Jennings' live suitcase-satellite uplink transmissions have stolen the dozen or so hours he previously had to compose a report, while film was being hand-delivered from one Asian capital to another. Products coming in on time and 50 percent over budget are far more profitable than products coming in six months late and on budget, so winning companies are scrambling to compress everything - from product-development cycles to each link in the supply chain. Classical music stations shave seconds-long breaks between movements, "jerking the listener from the andante to the minuet without a breath."

We are moving from nanoseconds to factoseconds and from terabytes to petabytes, and Gleick sees wonder in it all: "It might be best to think of the one-minute news report as an art form that takes terseness and concision to the limit, akin to the haiku or the oil-paint miniature," he writes in *Faster*. "A flashed image can be like a subtle allusion in a long poem, resonating just below the threshold of comprehension."

Arrange to meet Gleick once more, this time in April, in Manhattan, where he and Crossen have bought an apartment. "I feel tremendously busy," he tells me. "I still take time to play bridge." When I ask him how the accident has changed his perception of time, he answers: "Too soon to tell."

We meet at a restaurant near his new place; Gleick quickly slides into the booth, shoving his cane out of sight.

His manuscript is stacked on the table. Having read it, I know that it's magnificently researched and written, but as I tell Gleick, it left me feeling shortchanged in two ways. First, the book doesn't offer much direct analysis of the here's-what-you're-gaining, here's-what-you're-losing variety on society's acceleration. Gleick does a great job showing that we're all hurrying up, but I was looking for some conclusions about whether our rushed environment is resulting in, say, better or worse business decisions. I wanted to know: Is "faster" good for us? Or not?

Gleick frowns. Making such judgments is not what he set out to do, but when pressed

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By Andrew Leonard Cynics doubt Linux will ever go mainstream, but legions of Linux crusaders have their sights set on "world domination." Are they nuts? Maybe. But never underestimate the cooperative power of passionate programmers in the free software tradition. After all, they gave us the Net. To them, Linux isn't just an operating system, it's a way of life. They're true believers. Of course, they have to be. Mere technical superiority will not win the battle. Not when the opponent is as ruthless as [next page | www.salon.com/w](http://www.salon.com/w)



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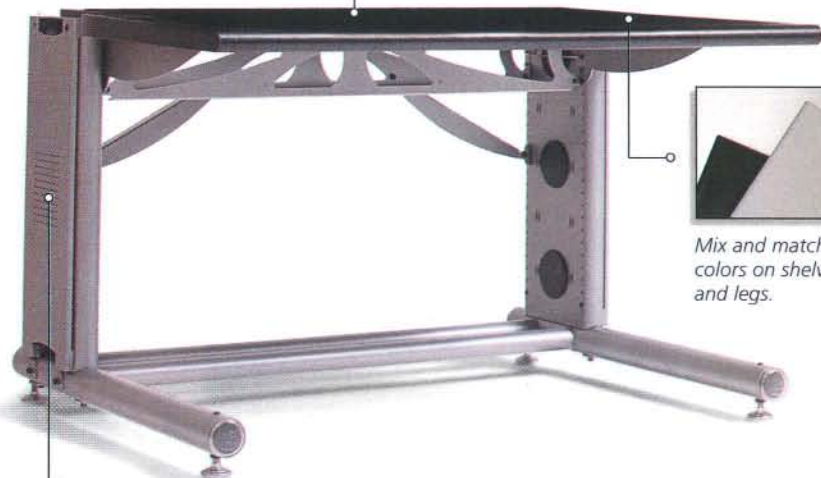
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he not too surprisingly comes down on the side of rapid forward motion. "People have this kind of false nostalgia for primitive societies where time isn't money," he says. "But at every stage where humans have had a choice between that existence and a more complicated and busy existence, we've chosen the complicated, busy existence. The fact that we've made those choices does not necessarily mean that we're idiots. It might be that we're right and we're having trouble coping with the consequences because we haven't thought it all through."

The book is basically silent about Gleick and his own relation to time. Why?

"That would be too egotistical or navel-gazing or easy or something," he says. "You don't have to read far between the lines to see that I'm writing about a personal experience. Sometimes I feel that I'm a victim of 'hurry sickness' in the classic sense. I'm not happy if I get to the airplane too early. I see myself taking ridiculous shortcuts to save tiny amounts of time. So you could view the book as an elaborate exercise in self-justification." He laughs.

"Have you wasted a lot of time in your life?" I ask. "It doesn't strike me that you have."

"Why would you assume I hadn't?"

"You've had a bunch of professional accomplishments in a very short span of time, any one of which would have satisfied most people."

"That's very flattering. But there's no connection - and you should know this, having read my book - between accomplishing things and wasting time. It is not true that people who accomplish things don't waste time and that people who waste time don't accomplish things. The very concept is ill-formed. You can't waste time and you can't save time; you can only choose what you do at any given moment."

He scans the manuscript, flipping around to make sure I've been reading the most up-to-date version. He stops when he arrives at the dedication page. It reads:

*For Harry
In Memory
Not Enough Time*



Contributing editor David Diamond
(ddiamond@well.com) profiled *Wind River Systems'* Jerry Fiddler in *Wired* 6.09.



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One Nation, Invisible

What happens after ethnic cleansing ends? **Bruce Sterling** reports from the postnationalist future – Cyprus, haven of undeclared peace.

At the death of the 20th century, it's open season on Muslim ethnics. The Milosevic regime and its war-criminal militias are throwing a pogrom. They shoot and shell Muslims, "disappear" their leaders, rape the women, set fire to the crops, bulldoze the villages, and chase the locals over the borders, wholesale. Those who resist and refuse get thrown into mass graves.

These recent dire events in Kosovo mirror what happened in Cyprus – 25 long years ago. There, the bitter, endless rivalry of two quarreling parent states, Greece and Turkey, gave rise to vengeful ethnic militias who burned villages and uprooted thousands of civilians. Air strikes followed, UN ground troops tried to restore peace, barbed wire flew up, land mines speckled the landscape, and journalists collected ghastly atrocity photos.

Then, finally, the undeclared war stopped.

When undeclared peace broke out, the island found itself cruelly divided into the official, recognized, Greek Orthodox "Republic of Cyprus" and an illegitimate

region later proclaimed the "Turkish Republic of Northern Cyprus." The latter, a weird little armed protectorate, today contains 190,000 people, 99 percent of them Muslims. Their unreal, propaganda-drenched situation on the ground – along with today's very similar chain of events in Kosovo – suggests that the Turkish Republic of Northern Cyprus is a kind of military/political lab experiment. It's a living, breathing futuristic scenario for a new sort of planetary area: the 21st century's Muslim ethnic netherworld.

These people live outside the New World Order's game plan. As do plenty of others: A brief roll includes Kosovo, Bosnia, the Bekaa Valley, Chechnya, Nagorno-Karabakh, Abkhazia, East Timor, northern Iraq, southern Iraq, every bit of Afghanistan, the Sudan, Algeria, Kashmir, South Lebanon, the Western Sahara, and the Gaza Strip.

The distinguishing mark of the Turkish Republic of

The Ghost City, empty for 25 years, in the Turkish Republic of Northern Cyprus.

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Northern Cyprus is that, unlike those other highly disturbed places, it is at peace. Nobody bombs it or shells it. Its people live quietly at the crumbly edge of Europe, and they survive, and they even make a little money. They're not refugees. They have become a New World Order counterculture.

Turkish Cyprus may be diplomatically suspect, but like other outlaw zones in history, it has become a busy locus of illegality in finance, espionage, and military affairs. Its situation is outside the pale of decency, as that's haltingly defined by the UN General Assembly, but it's still a workable way of life. It could have a very big future.

Mind you, there was never any real resolution of the basic conflict. Genuine peace never arrived in Cyprus, but there's been no slaughter since 1974. There are Turkish military bases all over the place to keep the Greeks from flooding in; the UN runs back and forth, harmlessly blowing whistles and taking pictures, and somehow the cease-fire holds.

So Turkish Cyprus has peace and borders; it just doesn't officially exist. Which makes it of inherent political interest - even though it's small, weak, backward, poor, mostly offline, and almost totally forgotten by the

long and up to 5 miles wide. It's patrolled by chattering UN helicopters and overseen by guard towers. This no-man's-land is a full 3 percent of the island, and it contains thousands of land mines.

Like every other place in the Mideast and the Balkans, Cyprus boasts many ancient, bloodstained stone fortifications. The Green Line is the 1960s version of a Cypriot medieval wall. But this barrier is built, quite properly and aptly, out of cheap consumer goods. In downtown Lefkosa, the Green Line is made mostly of big, rusting oil barrels shoved

ness. It's about stubborn, bitter, total denial. About a willing refusal to look. The Turkish Cypriots have symbolically turned their backs on the enemy with a profundity that defies foreign belief. Heaping garbage along the Green Line somehow makes the Greeks beyond it even more invisible. The enemy is farther away than Antarctica. The Turkish Cypriots don't see him. They don't touch him. They don't hear him. They don't know him.

There's an eerie majesty in this blanket rejection of other people's notions about



"This land is ours": a propaganda postcard from the north.

reality. It's astounding to physically confront so much of it, going on so incredibly long. I spent so much time staring balefully at the wire and junk along the Green Line that a local family

noticed me, invited me into their home, and gave me tea and cigarettes.

Parked in a modest working-class apartment abutting their bullet-pocked fortress of ethnic death, these Turkish Cypriots couldn't have been more warm, open, human, and hospitable, even though dragging a foreigner into their home wasn't exactly a win-win notion. An eccentric, elderly uncle, who had once been a barber on a local British army base, translated for us. Mom poured tea and handled the TV remote. Despite their dodgy locale on the UN-patrolled rim of a non-existent country, my impromptu hosts possessed a handsome color television, their own satellite dish, and a European PAL-style VCR. The whole family sat beneath a gold-framed portrait of the Republic's president, Rauf Denktaş, a wily, portly fellow, attentively watching Turkish TV.

We traded broken small talk until the news came on. The family was extremely eager to see this news, because this was a red-letter day for Turkey - and, by extension, Turkish Cypriots. A Kurdish separatist (not quite as bad as a Greek, but close)

Kosovo will look like Turkish Cyprus someday, if Kosovo is lucky.

world's great powers.

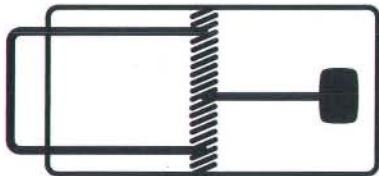
Kosovo will look like Turkish Cyprus someday, if it's lucky. "Kosovo," or whatever people call it in 2024, will be small, balkanized, and politically, legally, and economically screwed up. It will be semi-sort-of independent, scarred with bullet holes, land mines, and old hate. Maybe it will also be picturesque, an off-the-beaten-track tourist draw, an overgrown rather than an active graveyard.

Now that Berlin is full of new skyscrapers and German media yuppies, the broken Cypriot city of Lefkosa/Nicosia is the last divided capital in Europe. The Green Line, which runs right through the heart of town, is the legendary cease-fire zone of armed apartheid that cuts the island of Cyprus across its midsection. It's a hostile, mostly uninhabited wilderness, 110 miles

full of dirt; as you walk along, these yield to bulldozed bunkers with thick green overgrowth. Then to tall sheets of bullet-pierced tin, followed by cracked concrete, and then big, rusty, tetanus-gleaming coils of filthy barbed wire. Then you find nail-studded wood, and woven wire and tar paper, and even dry bamboo, and on and on. The fortifications are largely homemade, almost humble, and lavishly heaped with trash. Some parts of the Green Line sport entire dead cars.

After a while it dawns on you that something very strange yet deliberate is going on here. Strident signs everywhere firmly forbid you to take any photographs. But why? The UN photographs all of the Green Line routinely, and anyway, there seem to be no possible military secrets there.

It's not simply a military security issue; rather, it's about a bizarre enforced blind-



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named Abdullah Ocallyan had just been snatched out of Africa by three Turkish spies in sport shirts and black ski masks.

The sight of their nation's terrorist enemy, blindfolded, handcuffed, duct-taped, and trussed up like a Christmas turkey, filled my hosts with unfeigned glee. A successful Turkish moon shot couldn't have made them any prouder or happier. At that moment, three anonymous men wearing black ski masks were Turkey's foremost national heroes.



It has its own private beach-front, a swimming pool, restaurants, many tall whitewashed walls, much exotic foliage.

The Jasmine Court Hotel – by no coincidence – also boasts one of the largest casinos in Europe. This fabled gambling den is a single enormous barn, with several thousand blinking, yacking, American-made slot machines, plus some unused roulette wheels and a few desultory card players. The largest wall features, of all things, a giant

When you don't exist, **corruption** is the true killer app.

Lefkosa, chopped violently in half and pockmarked with the scars of house-to-house sniping, has the appropriate look-and-feel of a tough place. My real home base in Turkish Cyprus, however, was the charming seaside town of Girne/Kyrenia. If you've ever seen a Mexican ocean resort, nothing about Girne would surprise you. The streets are cracked and run-down, the electricity's spotty, the water supply is increasingly constrained. But Girne is civilization: There are computer stores, cell

phones, glossy fashion mags, all lolling in the gentle sun under huge, ancient castles built by 12th-century French crusaders.

Girne has no detectable unruliness of any kind. If you leave an empty plastic bag on a cafe table, the locals will run after you to courteously return it. Compared to Girne, Peoria is a maelstrom.

My home away from home, the Jasmine Court Hotel, is one of Girne's largest and most ambitious resorts. It's a major tourist draw, and a linchpin of the local economy.

mural painting of rootin'-tootin' Turkish cowboys, in hats, mustaches, and spurs, playing poker in some imaginary Nevada. The casino has metal detectors at the entrance, cold-eyed, bow-tied security men, and a large, circular bar suitable for encouraging recklessness in the clientele.

The Jasmine Court was built by Turkish Cyprus' richest and most famous businessman, Asil Nadir. Mr. Nadir is an international mogul who started a Cypriot/British multinational called Polly Peck. In the go-go

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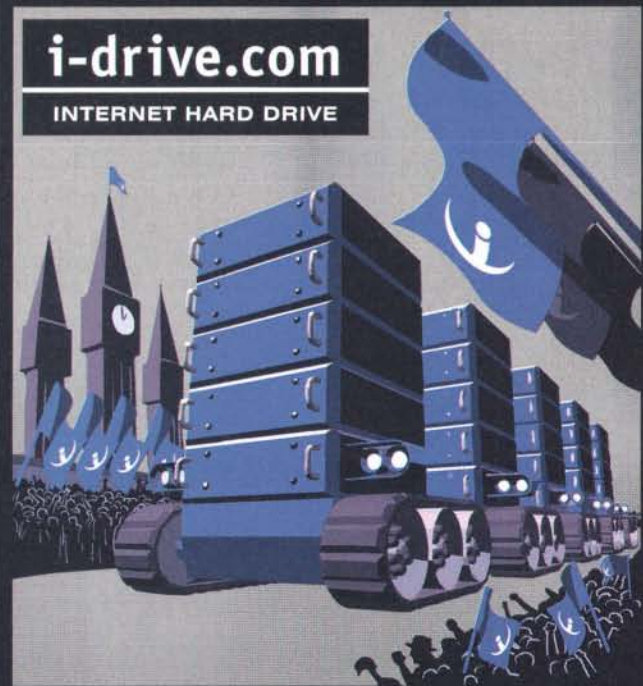
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1980s, Polly Peck was a booming conglomerate moving everything from fruit to electronics. Its British connection was perfectly natural, since "Cyprus" as a whole is still officially considered a Commonwealth country. For 25 years, the British Foreign Office has tried to ignore the entire concept of the Turkish Republic of Northern Cyprus, attempting to treat the locals as if they were all loyal patriots of a single state. Over the years, huge numbers of the original Turkish Cypriot population, clutching their Commonwealth visas, have pulled up stakes to live in Britain.

So Mr. Nadir had the wherewithal to become an entrepreneurial star in both Cyprus and the UK. He was moving from commercial strength to strength and had many devoted friends in the upper reaches of the Tory Party. Then he fell afoul of Britain's Serious Fraud Office when his enterprise crumbled under a debt that reportedly exceeded £500 million.

Where did the missing money go? Who knows? But things looked pretty dark for Mr. Nadir; he was assessed a tremendous bail in preparation for a dramatic fraud

trial in the UK. Then he skipped the country in his private jet. Turkish Cyprus, since it isn't recognized by Britain, has no extradition treaties. Mr. Nadir came down to earth in one of his local mansions and simply defied the British cops and lawyers to dig him out. They couldn't. There was just no way to get a grip on him, and there hasn't been since.

After Mr. Nadir's financial embarrassment, the Jasmine Court eventually came into the possession of the rapidly expanding, multinational Emperyal casino chain. The mogul of the Emperyal chain was one Omer Lutfu Topal, a silver-haired heroin entrepreneur. Mr. Topal had close ties to Turkish intelligence, such close ties that in 1996 several agents of Turkish intelligence reportedly had Mr. Topal murdered in order to grab his business holdings for themselves.

Which means I'm a guest, in Room 130, of a gambling establishment built by a multinational swindling suspect and operated for years by a smack dealer who, when assassinated, had allegedly just sent a \$17 million bribe to Turkish spooks.

Alas, I don't have space to get into the

many other operative complications, but here's the crux of the matter: When you don't exist, corruption is the true killer app.

The local corruption can be documented easily enough (a random issue of the local English weekly newspaper details a £3 million bank swindle and an international car theft ring), but what's more relevant is the fact that Turkish Cypriots have nothing much to gain by honesty. They're not allowed to play the New World Order game, so they have no stake in its persnickety rules and procedures. You can't cut diplomatic relations with Turkish Cyprus - it doesn't have any. Economic embargo? It's got one already, thanks.

Not existing brings inherent operational difficulties. These burning local grievances were presented to me with great clarity by Ozdil Nami, a Turkish Cypriot political analyst who works for the president's office in Lefkosa. Young Mr. Nami is a Berkeley-educated Fulbright scholar, and he's as bright and polite a spin doctor as you are ever likely to meet.

First, Mr. Nami told me earnestly, the Turkish Republic of Northern Cyprus has

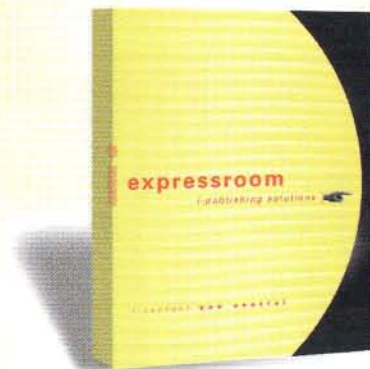


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no airline certification, so there are few direct flights to the Republic: Only Turkish airlines can fly there, and only from Turkish airports. Still, getting in is relatively easy. Getting out is much harder. Turkish Cypriot passports aren't recognized by most global travel authorities, which makes obtaining visas a permanent crisis.

The Republic is not part of the world postal network; there is no official zip code. Most mail naively addressed to "Turkish Cyprus" is swiftly routed to enemy Greek Cyprus, where the Greeks get up to all kinds of mischief with it. If you want mail to get through to Turkish Cyprus, it should be fake-addressed to "Mersin 10, Turkey."

Ownership of land in Turkish Cyprus is a big legal problem. One Greek Cypriot has taken the matter to the European

Visitors look across the Green Line no-man's-land from a Greek "tourist bunker."

Court of Justice and successfully claimed their land in the Turkish part of the island to be stolen property. Sheep and oranges originating in Turkish Cyprus are also viewed as the proceeds of a 25-year-old theft, and the European Community won't buy them.

International authorities give big development loans to Greek Cyprus, but the money never reaches Turkish Cyprus. Culture and arts exchanges with the rest of the world are pretty much out of the question. Perhaps the most galling insult is that Turkish Cypriots, soccer fanatics of the deepest dye, cannot compete in sports under their own flag.

The Republic would love to be a real country, at least as real as, say, Andorra or Monaco. "Federation," "confederation" – endless Cyprus peace proposals have been offered over the years. But the negotiations are going nowhere, and Mr. Nami was by

no means optimistic about their future. Meanwhile, he firmly insists that the Turkish Republic of Northern Cyprus is already a real, legitimate state. His nation is waiting for the rest of the world to stop senselessly persecuting it and do it justice.

But of course, the status quo isn't all bad. I asked Mr. Nami what would happen if the UN monitors left the Green Line. He said there would be many more cross-border incidents, but the Turkish Army would surely hold firm.

And what if the Turkish Army left?

"Then the Greeks will attack," he said with perfect confidence.

Turkish Cyprus would love to be a **real country**, at least as real as, say, **Andorra or Monaco**.



Then, in the mid-1970s, the Greek military junta grew desperate. It was a sorry Cold War junta, tolerated by NATO because it rarely failed to black-jack Communists, but it was losing all popular support in Greece. So, in a daring gamble, its leaders decided to launch a glamorous military adventure inside Cyprus.

This Cyprus imbroglio was very popular in Greece – anything that alarms Turks is always popular in Greece. But, like the Argentinean junta in the Falklands, this crew didn't have the firepower to back up their ambitions. They went so far as

One may naturally wonder how this fertile and fragrant island, the legendary birthplace of the goddess Aphrodite, got so utterly messed up. Well, Cyprus is a very, very old place. It's no use beginning at the beginning, because then you have to point out that Cyprus once had its own race of dwarf elephants. Modern Greek Cypriots and Turkish Cypriots are no help at all because, although they claim they have a national history and they loudly chew over it all the time, what they really have are two intricate, dual theologies of vicious ethnic grudges. Outsiders who dare to describe Cypriot history will be sternly reminded that they know nothing – that they have abjectly failed to

to destabilize the weak Cypriot government, and provoked a heroic shoot-'em-up among the local militias. The much greater numbers of Greek Cypriots got the upper hand on the ground. The angry Turks "intervened" from the very, very nearby Turkish mainland and split up the island at bayonet point. The Greek Cypriots immediately claimed that they were innocent civilian victims of illegal, bullying, military oppression. They demanded that this unspeakable barbarity cease at once, that all of Cyprus be placed in their hands. They've been demanding this for 25 years, but the stalemate is perpetual. Neither side in Cyprus will come out of the hard, paranoid shell of

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its ethnic mythology. The situation is double victimology at its best.

Like the Serbs today, the Turkish Cypriots would rather boil septic water and eat roots in their blacked-out ruins than give up their self-defining, blood-drenched national myths. Since only the Greeks are willing to actively march out and shoot them, and since the Turkish Cypriots are very well armed by the Turks, they cannot be obliterated, or assimilated. But they still won't

influenced for years by a covert clique of government-supported, heroin-smuggling assassins. (The Republic of Turkey reportedly has 2,700 unsolved political murders.) This horrific spy scandal makes Iran-contralook like a Boy Scout jamboree. It was known as the Susurluk Affair. Quite a lot of the Susurluk skullduggery was financed and run not within Turkey proper but in Turkish Cyprus, where it was offshore and unrecognized and, therefore, plausibly deniable.

paragraphs, and the book is 400 pages long! The main activity of the Susurluk "state mafia gang" was liquidating enemies of the Turkish state. To facilitate this, they smuggled heroin and they laundered money, much of it inside the casinos of Turkish Cyprus. Some say they used the black money to kill ethnic Kurds in Turkey.

In the rhetoric of the Kosovo crisis, as we know, Kurds are never hard to find. The Kurds have been catching it almost as badly as the Kosovars, only in slow motion. Iranians shoot them, Iraqis gas them - and Turks dispossess them, fight them in the hills, and deny them their heritage.

There are 25 million Kurds - they are the world's largest submerged nationality. As the costs and casualties from grinding away at the Kurds have risen in Turkey, more and more money is required for the dirty war. And since one result of the Susurluk scandal was that Turkish casinos were banned - inside Turkey, that is - Turkish Cyprus now contains all of the Turkish casinos. Thus, the invisible economy is booming, visible across the island in an unexplainable rash of luxury cars and flashy hillside mansions.

When you are invisible and **unmentionable**, it tends to **fertilize** your eccentricities.

obey the rules. So they have to be ignored. And they *are* ignored, but when you are invisible and unmentionable, as well as zealous and heavily armed, it tends to fertilize your eccentricities.

On the face of it, recent events in Turkey and Turkish Cyprus have been utterly fantastic. Turkey has endured an espionage and corruption scandal of titanic proportions. It has been publicly revealed that this NATO power of 65 million people was

The 1998 book *Cetele mafya iliskilerinde* (Gang and mafia relations) shows the incredible scope of the Susurluk Affair. It's a stark, alphabetical list of the major figures in the investigation: offshore bankers, intelligence chiefs, cops, arms smugglers, croupiers, casino owners, members of Parliament, gangsters' molls, rural warlords, government ministers, party fund-raisers, lots of dead Kurdish terrorists, and so forth. Most of the players get only one or two

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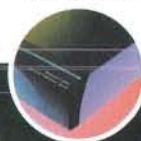
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The northern Republic is richly gifted with Turkish military bases. Some 30,000 Turkish soldiers, every man jack of them neatly kitted out in top-of-the-line NATO gear, rumble constantly about on mysterious errands, in big dun-colored jeeps and army trucks, toting highly efficient automatic rifles. One frequently hears the distant gutsy yells of massed Turkish commandos, and the rifle crack of their target practice.

There are soldiers galore in Lefkosa, in the core of the island. Girne also has a military presence. There are soldiers and barbed wire near the third city of the little Republic as well, Gazimagusa/Famagusta, on the island's east coast, a hop from the seething ports of Lebanon.

Once upon a time, Gazimagusa was the richest city in Cyprus. That was back when the island was ruled by the Lusignans, French adventurers who supposed themselves to be Christian kings of Jerusalem during the Crusades. These bold knights actually grabbed Jerusalem for a little while. Then the enraged Muslims rose up, beat them like drums, and threw them into permanent exile. The Lusignans retreated to



The Dome Casino, one of many gambling dens in the coastal city of Girne/Kyrenia.

nearby Cyprus, prospered mightily, made great wines and brandies, got into the Mideastern spice and drugs trade, and built lavish cathedrals and monasteries.

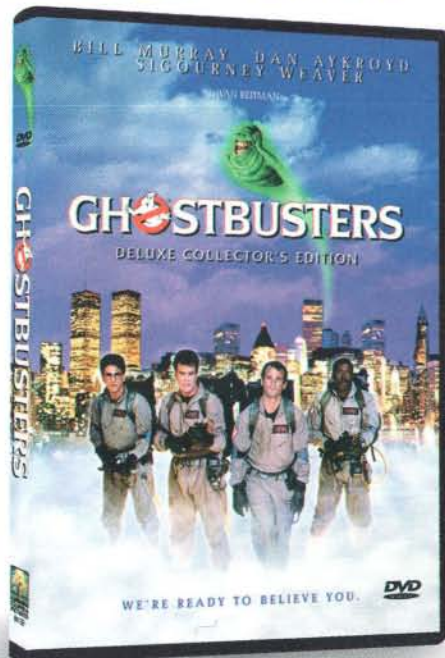
Their noblest cathedral there has become the local mosque. To hear a muezzin wailing out of a Notre Dame-style Gothic tower is a strangely liberating and refreshing experience. One day I wandered through the medieval inner city and clambered up onto the well-preserved fortress parapets. I noticed that the ancient stone arches over Gazimagusa's crooked entryways had been nicely retrofitted with 1970s machine-gun nests.

Except for offshore enthusiasts of medieval military engineering, very few people clamber around those city walls now. When I slid and jumped my way down from one, I had to take a shortcut across a local soccer field. Unfortunately, this field was near a garrison of the Turkish Cypriot Army, which is how I ended up in army custody.

I was ratted out by a local 9-year-old. This alert little fink saw me traipsing past the goalposts and took off like a shot to tell his good buddies, the soldiers. I was hailed by a fast-moving squad of four crisp, clean-shaven men half my age. They surrounded me at once, and marched me over to meet

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their sergeant. My juvenile captor accompanied us, capering in joy and grinning triumphantly at my discomfiture. The Turkish sergeant, the only one among the five adults who spoke any English, examined my Yankee passport. He sternly told me that I had trespassed on forbidden property. I expressed my deep, NATO-style regret for the mishap. He then asked what was in my suspicious-looking shoulder bag. I showed the entire squad pictures of my children (this stunt almost always works). We began discussing kids. The soldiers cordially explained to me that my 9-year-old betrayer was their “commando.”

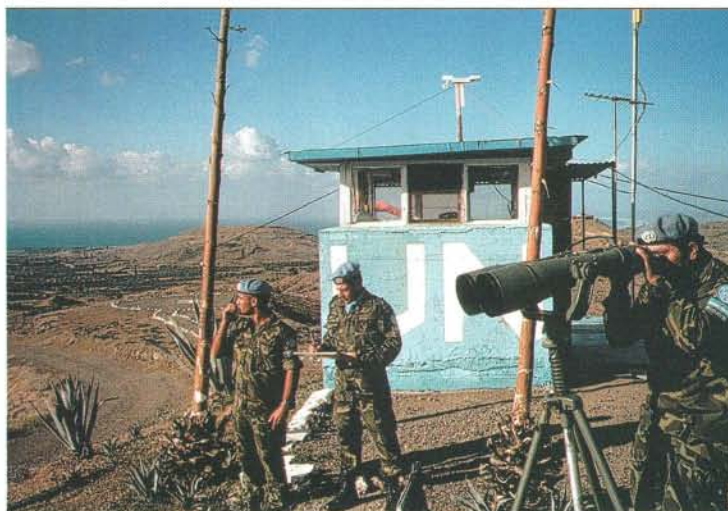
I was escorted off the base by a private. As soon as we were out of military jurisdiction, my escort swiftly talked me into buying him a pack of cigarettes. Locked inside the war machine, the poor guy didn't have the proper scrip to make his own purchases in the town. So I bought him two packs of Benson & Hedges. It was clear that this small act of graft would make him quite a popular guy back at the barracks.

These Turkish soldiers couldn't have been more gentlemanly about this incident; they treated me far better than some suspicious-looking Mideastern Turk would have fared on an American army base. I don't

These are very troubled times for Muslims, and the Republic of Turkey is the closest thing the Muslim world has to an advanced industrial nation. Its internal politics – weird, violent, bloody, thoroughly corrupt though they are – are at least as good as and usually much better than any other country's in the region. Turkey is the one Muslim nation-state on earth that can truly kick ass and take names. Better yet, of all NATO powers, Turkey has the strongest and most promising position inside the remnants of the Soviet Union. There are Turkish-speaking peoples in a huge Asian

thing. The Turks are masters in their own house in Anatolia, and they have half the house next door. If the UN doesn't like it, tough.

Little Turkish Cyprus could even get a new diplomatic deal, thanks mostly to Serbia. For years, the Turkish Cypriots' paranoid fantasies about Christian genocide have been dismissed as, well, paranoid fantasies about Christian genocide. After Kosovo, those fantasies don't dismiss so easily. As for the illegal Turkish “intervention” in Cyprus in 1974, NATO's “interventions” in Kosovo and Serbia in 1999 are on equally



A United Nations unit of Argentinians keeps watch over Morphou Bay.

shaky legal ground – if not shakier. So the doubting world may yet somehow admit that the Republic exists!

While they wait, there might be compelling reasons

I ended up in army custody – I was **ratted out** by a local 9-year-old.

believe I was even ever formally under arrest. It's just that, you see, the Turks really do care a lot about their security. They are very, very serious about it, and large, wandering creatures with a camera can't go unspanked.

Turkey is a NATO alliance member. There are excellent reasons for this, because Turkey occupies a central arena of the New World Order's scariest endemic disorders. Turkey's pretty much dealing with it all: the Balkans, the Mideast, the decaying ex-Soviet Union, big oil, very valuable water, fundamentalism, ethnic separatism, the arms trade, the drug trade, and a huge diaspora of guest-worker Turks all over the planet. The country's got TV ads, jeans, designer clothes, McDonald's, Coca-Cola, beauty contests, and F-16s, but it's also got every modern crisis but nukes.

belt through Azerbaijan, Turkmenistan, all the way to China.

Then there's Turkey's archrival, Greece. Of all other NATO members, Greece has by far the coziest, chummiest relationship with the vile Milosevic regime. Milosevic's son Marko was sent to the family villa in Greece to sit out the NATO bombing campaign. Milosevic, who is a dictator and therefore a multimillionaire, has major offshore holdings in both Greek Cyprus and Greece.

Turkey didn't invent Cyprus or its troubles, and neither did Greece, but Turkey has zero intention of backing off over “Turkish Cyprus.” The US certainly isn't going to pressure the Turks, because the Americans owe Turkey big-time over the endless Saddam debacle, and nobody else is in any position to make the Turks do a

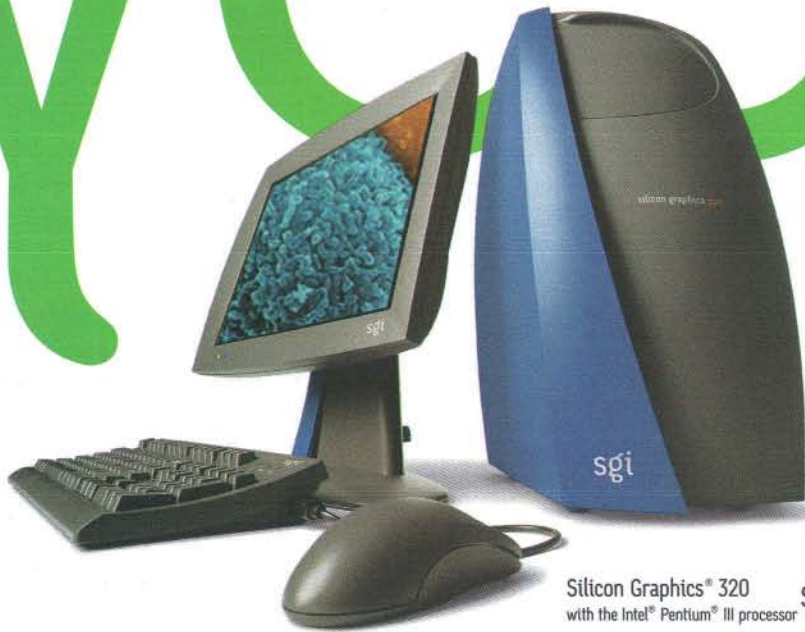
for the two sides in Cyprus to find a new modus vivendi. The whole island, which has limited aquifers and many demands, is running out of water. The closest fresh water is in Turkey, but the greatest need is in the Greek south. Already there have been Rube Goldberg efforts to move Turkish water to Cyprus using tugboats and gigantic plastic bags. Vague plans for a huge undersea pipeline float around.

Boysan Borya, a Turkish Cypriot lawyer, environmentalist, and peace activist who told me about the water shortage, thinks that liquid diplomacy makes a lot of sense in Cyprus. Why can't people agree about water? Water is a very simple, central matter. By Cypriot standards, Mr. Borya is a decided optimist. In his Lefkosa office, he told me that he felt that “peace could come quickly – as quickly as a war.”

But it was also Mr. Borya who directed me to the strangest part of the Lusignans' old haunt, Maras/Varosha. “You have to see the Ghost City,” he assured me, and he was right. It is a place dense with memories.

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Once upon a time, Maras, just south of Gazimagusa, had a large and thriving population of ethnic Greeks. After the 1974 battle, the Greek Cypriots decided that they didn't want to leave the Turkish Cypriots with any ready-made hostage population, so they pulled their fellow Greeks out of the region and back across the Green Line. But the Turks did not go into that part of the city. And so, the region became the Ghost City, abandoned entirely. The Greeks wouldn't stay there, and the Turks wouldn't go there. The place was politicized out of existence with the efficiency of a neutron bomb.

I imagined that the Ghost City would be a matter of a couple of neighborhoods, but it is scarily huge. I walked much of its perimeter for hours and couldn't complete my round. In 1974, the Ghost City was a thriving suburb in a charming resort town. Now, you could not ask for a more perfect metaphor for abandoned, blighted hopes.

In 25 years, the Ghost City has become an urban jungle the likes of which I have never seen. It's gone wild, but it's nothing at all like a natural wilderness. The city has been eaten by its houseplants.

The homes of the richest people, with the best landscaping efforts, now have decorative cactus bursting through porches, while former shrubs greedily eat the roofs and lintels. The place is loud with flocks of birds, which live off feral lemons and oranges. Every street and sidewalk is thick with knee-high grass. By the seaside, pigeons dwell in huge rookeries that were once pastel beach resorts.

Unlike in Lefkosa/Nicosia, nothing caught fire in the Ghost City, nothing was bombed or shot; they just turned the lights out on the future and fled. It's as if some tremendous, focused gout of hate and fear had caused the people there to vaporize.

The Ghost City is the one place on the island of Cyprus that really and truly Does Not Exist. It has become a great world capital of emptiness. If this is the future of a crowded world seething with implacable ethnic conflict, then believe me, you don't want to know about it. Because it's like a promise of doom. ■ ■ ■

Bruce Sterling (bruces@well.com) wrote "The Spirit of Mega" in Wired 6.07.

Yes starts here.

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Hollywood's Head Case

Inside the runaway brain of f/x guru Kevin Mack.

By Mark Frauenfelder

Here inside Kevin Mack's brain, I see a tangle of kelpy neurons and dendrites swaying in a clear fluid flecked with floating particles. Up ahead, there's a lightning storm of activity propagating down axons. Like a passenger in the microsubmarine from *Fantastic Voyage*, I'm tailing the signals as they crackle across the cortex and proceed through the skull, exiting via a pore on the forehead.

I'm not inside the brain between Mack's ears, of course. I'm in an editing room, looking at the brain he created on a computer for the opening scene of *Fight Club*, the dark summer movie directed by David Fincher and starring Brad Pitt and Edward Norton. Opening this month, *Fight Club* is about a group of ennui-soaked yuppies who get their kicks by beating each other up. The 95-second intracranial odyssey takes you from the fear center of Norton's brain, through his skull, and out

to a perspective where you see what he's so worked up about: He has a gun in his mouth, and he's thinking about pulling the trigger. The shot is the longest computer-generated scene ever produced by Digital Domain, the cutting-edge f/x shop where Mack works as visual-effects supervisor.

"It starts out in the amygdala and follows the thought from its origin," says Mack, who looks like a goateed Jeff Bridges. "Once we pass out of gray matter we sort of weave through a sulcus and see all the big arteries, and then we pass through the meninges, all the layers of the subarachnoid space, these chambers that distribute cerebrospinal fluid through the brain." He speaks in a dreamy, somewhat nasal voice, but there's a warbly undertone, as if he's suppressing the urge to rant.

Mack, the f/x power player, in front of a scene he painted for *The Power of One*.

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When Fincher asked Digital Domain for the brain fly-through, he already knew that Mack had transformed Marina del Rey into Beijing for *Red Corner* and had created the hypnagogic afterworld in *What Dreams May Come*. Fincher, and other directors like Luc Besson of *The Fifth Element* fame, request Mack because the 40-year-old artist and animator, matte painter and model maker, and photographer and compositor is a master at

and complex adaptive systems, and was aching for a chance to shoehorn his extracurricular obsession into a movie.

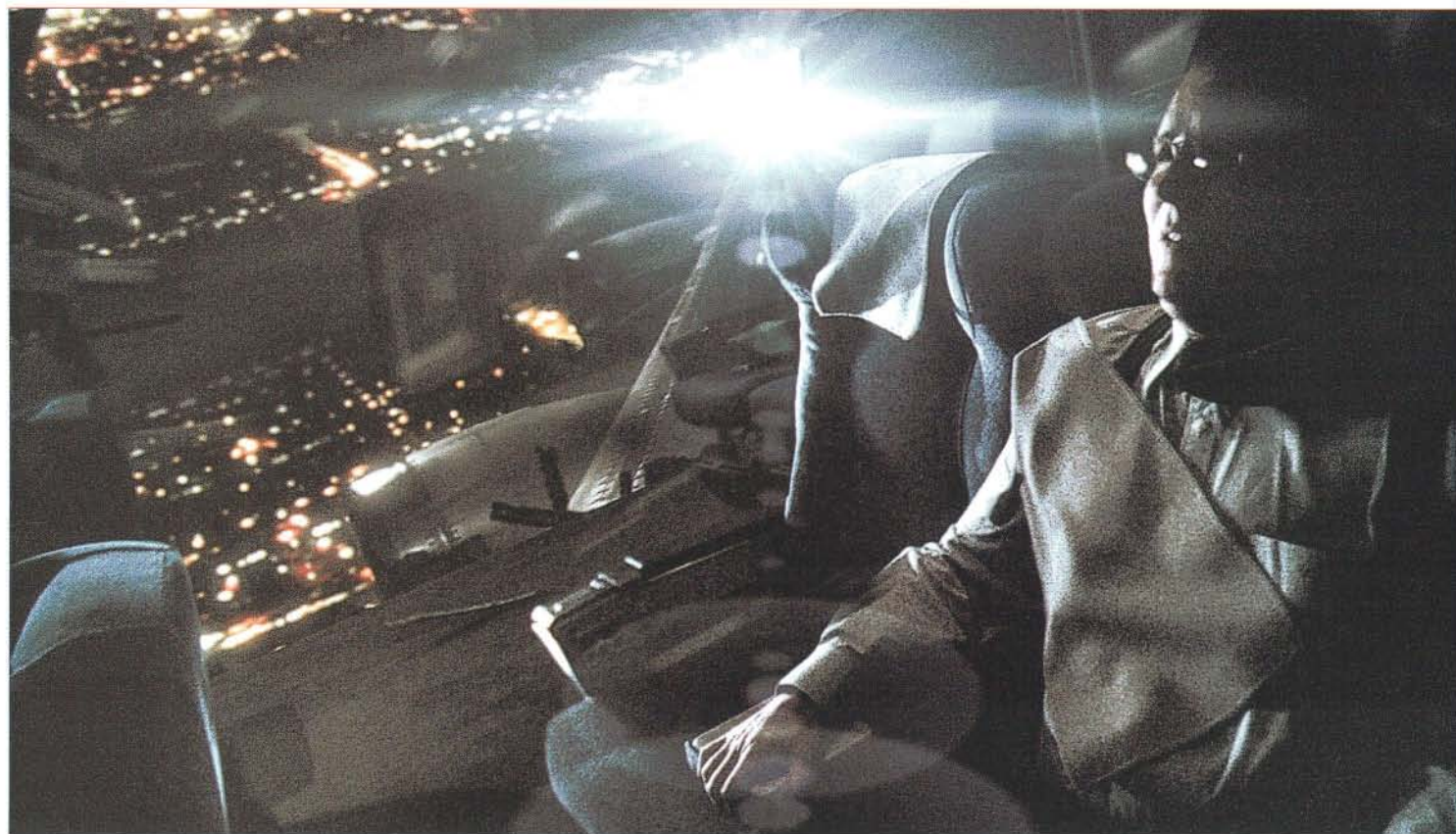
And it's doubtful any director knows Mack's foremost dream: to create an artificial world that lives beyond the movie screen, a universe populated with thinking creatures that will live and die within a computer and even communicate with him. That's the lobe in Mack's brain that isn't

victim clutches the armrests of his chair.

"That's me!" Mack says gleefully.

Mack's office in Venice, California, is shaped like an upended shoebox; the only natural light comes from a skylight 40 feet overhead. In lieu of windows, the walls are plastered with a seemingly random mix of toys, pictures, and papers. But the artifacts are imbued with meaning for Mack, and signify the influences and obsessions that have led him to where he is today. The Polaroid of Mack posing with an actor in a monster costume, for example, represents his fascination with cryptozoology.

Mack's dream transcends f/x: To create a universe of thinking creatures within his computer.



seamlessly weaving various components into live-action worlds. They know that Mack (who earned his first Academy Award this year as part of the f/x team for *What Dreams May Come*) is a leader among a new coterie of Hollywood wizards: the guys who create "invisible effects" – computer-enhanced scenes that fool the audience into believing the shots were produced with live actors on location, but are really composed of a mélange of digital and live-action footage.

But what Fincher did not know was that Mack had already devoured almost every major book on computational neuroscience

reflected in the adrenaline-pumping scenes of terror he's known for – like the airplane disaster in *Fight Club*. In this shot, a Learjet collides in midair with an airliner; its flight attendant is liquefied on impact, transformed into a red smear against the cabin wall.

"We've redone the whole splatter," Mack tells me while the scene plays out before us. "It's much worse now. It's like somebody took a shotgun to a Hefty bag full of ketchup." As the jet peels open like a can of sardines, the passengers are sucked from their seats one by one and sent hurtling through the air. One particularly disturbed

Mack's scream debut – as a terrified passenger aboard a plummeting Learjet in David Fincher's *Fight Club*.

Mack still vividly remembers the day he took an interest in monsters. He was 5 years old, visiting his aunt in Westwood. He says he was taking an afternoon nap when a "very tall, dark thing" entered his room. "It looked like a black, scaly, feathered bird, with a strange, black, shiny beak," says Mack. "Its eyes were wet, with real veins,

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and as big as baseballs. I knew it wasn't a mask." (Mack is completely serious about such recollections. After telling me a couple of other far-out stories, he laughs nervously and asks, "Are they going to lock me up, or shoot me for spilling the beans?")

Maybe the monster-vision thing is genetic. Kevin wasn't the first member of the Mack family to conceive of strange beasts: In 1940 his dad Brice Mack painted the cavernous

of Liberace and Michael Landon.

By 1985, Mack had neither a college degree nor a plan to become something more than fishbowl-scrubber-to-the-stars. But he did have a wife, Martha Snow Mack, a fellow art student who was about to give birth to their first child. In a panic, Mack's father yanked some strings and got his son a job at Coast Special Effects in North Hollywood, home of the Pillsbury Doughboy. There,

The Abyss. Director James Cameron liked what he saw and talked the kid up; from then on, good work poured in.

In his Digital Domain office, a half dozen posters of blue-skinned Hindu deities in his office hint at one of the more esoteric jobs in Mack's résumé. Over the years, he had studied Hinduism, and in 1991 he met Swami Chidvilasananda (known by followers as Gurumayi), the head of the Siddha Yoga Ashram, in South Fallsburg, New York.

At Gurumayi's invitation, the Mack family visited the ashram, and the Hollywood effects whiz was asked to design the Shiva Lingam, the sacred phallic symbol of the

"Who would dream of trying to construct a brain?" says Mack. "But we could grow something similar."



gut of Monstro the Whale for *Pinocchio*. Both of Mack's parents worked for Disney's animation studio, and they stoked Kevin's imagination further, inspiring him to copy the work of his favorite artists, especially that of sword-and-sorcery virtuoso Frank Frazetta. After graduating from high school, Mack gained admission to the prestigious Art Center College of Design in Pasadena, didn't quite graduate, hit the pavement, and got a job with an aquarium-cleaning service. A rubber octopus thumbtacked to the wall of his office marks the countless hours he spent scraping algae for the likes

Mack made miniatures and animated clay figures for TV commercials and feature films. He also demonstrated the first glimmers of a talent for visual-effects artistry that would later land him matte-painting gigs on *Apollo 13*, *Interview With the Vampire*, *True Lies*, and *The Fifth Element*.

After a few years, Mack went freelance, winding up at Dino DeLaurentiis' movie studio in North Carolina working on the flop 1986 sequel to *King Kong*. Two years after he arrived, the studio shut down and a nearly broke Mack family moved back to LA, where he scored a freelance job on

Two-minute psychoanalysis: Mack's fly-through-the-brain sequence from *Fight Club* starts inside Edward Norton's mind and ends on his brow.

Hindu god Shiva. "They flew some head Brahmin priests over from India who said I was the maha-sculptor of our age," Mack says. He made a small clay model and presented it to Gurumayi at a ceremony before 5,000 people. The Shiva Lingam was shipped to India, where it was cast in silver and ensconced in a temple. It's still there,

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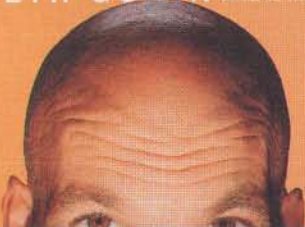
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bathed periodically in milk and ghee.

As Mack and his family prepared to leave paradise, Gurumayi asked them to stay, and even paid the bills mounting back home. "But it was clear we didn't belong there," Mack says. The Siddha Yoga Ashram "draws a crowd of seekers whose goal is to be utterly serene." Kevin and Martha wanted to be noisy. He missed going to drag races. They were itching to play in their psychedelia

Mack is known for working with an obsession bordering on the pathological. "A lot of artists are content with a limited understanding of the tools they use," says Caleb Howard, who worked with Mack at Digital Domain and is now an R&D supervisor at Los Angeles special-effects house Rhythm & Hues. "Kevin is never content. He's an artist who aspires to know his medium."

Hollywood artistry runs in Mack's family. His dad painted the cavernous gut of Monstro the Whale for *Pinocchio*.

band the Fringe. So they returned to LA, and when James Cameron, Stan Winston, and Scott Ross were launching Digital Domain, Scott called Mack and convinced him to join the team.

In his tenure at Digital Domain, Mack has worked as a computer artist, digital-effects art director, and visual-effects supervisor on more than a dozen movies. Besides producing mind-bending scenes that have viewers wondering how they were pulled off, Mack is increasingly asked to create effects that are special because nobody watching them would guess that they were "filmed" mostly inside a computer.

Jon Avnet, director of *Red Corner*, the 1997 thriller starring Richard Gere, says that given the ubiquity of bluescreen shooting, movies are approaching "the beginning of a whole new day" when most everything is shot on bluescreen. "Kevin will be at the forefront when that happens," he says.

Avnet credits Mack with an "amazing ability" to fabricate realism from a patchwork of CG and live action. Because the Chinese government forbade Avnet to film on location in Beijing, the director relied on Mack to blend actors filmed in Los Angeles with still photos and Steadicam footage of Chinese locations, shot on the sly by the director and a crew of guerrilla cinematographers. Avnet took three nighttime photographs of the American Embassy with his 35-mm camera. Stateside, he handed the blurry exposures to Mack, who, he says, "degraded them and made them into a background." The result, says Avnet, was "a miracle to me."

Back in his office, the 12-foot-long print-out of computer code hanging from his wall is testament to Mack's whole-hog disposition. Here's a snippet:

```
/J]-!F/[\\F+\\!BT//J]!/+/XT//J]-!F[\\F+\\!F+\\-  
!/F["!//BT//J]" +!F["" +/~$\\  
!!E]T//J]!/+/F+/"F-!F+/F["!//F/^FXT//J]-  
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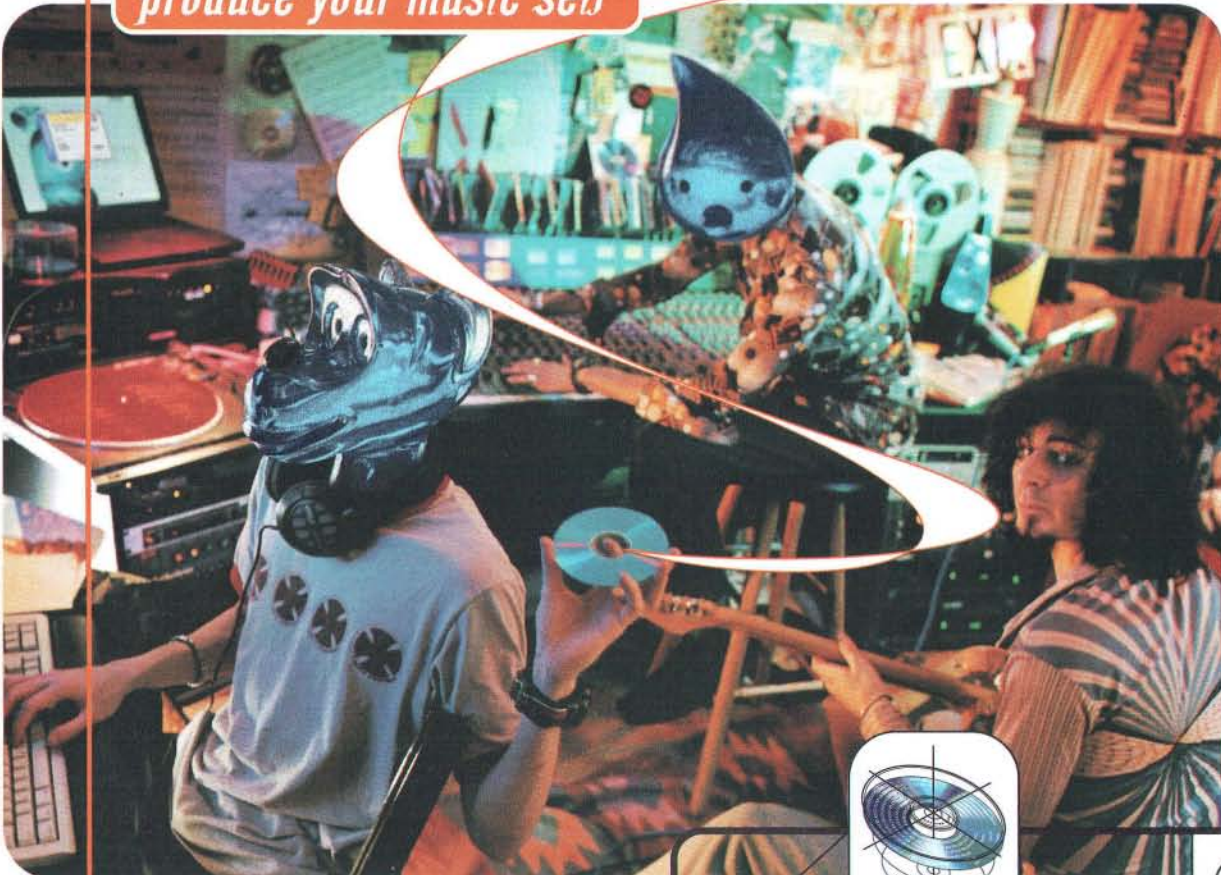
These strings of characters are the DNA of a digital seed that grew into the blossoming tree in *What Dreams May Come*. The tree, as well as the brain in *Fight Club*, were built using an L-system, named for botanist Aristid Lindenmayer, who in 1968 developed a mathematical system to classify plants according to their branching structure.

But L-systems can also be used to synthesize images of lifelike structures. You can write a program that uses an L-system as a set of rules to specify the length and angles of the branches and sub-branches of tumbleweeds, capillaries, bronchial systems, and neural anatomy. L-systems could, Mack believes, enable a-life researchers to "grow" pseudo life-forms with strikingly organic anatomy.

Mack, an admitted "artificial-life zealot," says he "got into neuroscience to look for ways we could create lifelike intelligence," a fantasy project that's consumed his evenings for years. He already knows enough about the brain that last year he was asked to speak at the dedication of the Brain



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Mapping Center at UCLA. "He's extremely well read," says John Mazziotta, the center's director. "His theories are unconventional, but that's what makes them interesting."

Speaking to hundreds of neurology pros, Mack introduced himself as an "amateur neuroscientist" and spouted "a few ideas on evolving complex neural topology," including his plans for growing software-based "mice men" and "creating a form

resources has been around for some time. (See "Do-It-Yourself Darwin," *Wired* 6.10, page 164.) A common type of artificial life is the genetic algorithm. An example: You start out with 1,000 randomly written "programs," really nothing more than haphazard strings of 0s and 1s. Then you see how well each can perform a specified task, such as arranging a list of words in alphabetical order. Of course, the programs won't work

and mutate - and, in addition, make them look like realistic creatures. They're developing a suite of programs to make artful a-life, and searching for a well-heeled benefactor to fund their plans for a research lab and think tank. Mack's erstwhile HARD partner, Caleb Howard, has been cranking out code for the project. The third member of the a-life effort is Gregory Simpson, a neuroscientist at the Albert Einstein College of Medicine in New York City. Simpson - who met Mack at the UCLA Brain Mapping Center inauguration - specializes in computer modeling of brain function and imaging of brain activity, and has worked

Mack undertakes assignments with a degree of obsession bordering on the pathological.

of artificial intelligence based on biologically inspired neural networks."

Before the brain, it was the musculoskeletal structure that consumed Mack's attention. A few years ago, Mack and then-coworker Caleb Howard got the green light from Digital Domain to launch a skunk-works project called HARD, short for Human Animation Research and Development. They buried themselves in anatomy, kinesiology, and artificial-life research papers and then turned that knowledge into a piece of software that could produce realistic human bodies.

Now, building on the HARD system, Mack and his array of high-speed workstations have taken on a nearly impossible project - evolving realistic-looking life-forms that exist only in a computer. Ones as smart as, or smarter than, him.

"People say, 'Oh, you'll never be able to construct a human brain,'" he says. "Well, duh! Who would dream of such a thing? With billions of neurons all hooked up the way they are? I don't think so. But we could grow something similar," in much the same way that his *Fight Club* brain was grown from a digital seed.

The idea of creating computer-based worlds populated with creatures that can breed, evolve, and compete for limited



The creator and his creation - a hyena-swine man - on the set of *The Island of Doctor Moreau* in 1995.

with the Dalai Lama, studying the effects of meditation on attention and consciousness.

So far, Mack and Howard have developed a program, called Morphogenesis, that picks up where HARD leaves off - giving them the ability to cross-breed the bodies that HARD churns out. Using another program still in development, the team will define the details of the virtual environments (such as wind and gravity) and of the critters themselves (such as herd behavior and locomotion). The next step will be, well, harder: giving the little beasts they create some intelligence. Mack believes the right mix of neural networks, genetic algorithms, and a sufficiently stimu-

lating artificial environment will do the trick. "Kevin's taught himself enough to do it in a way that's quite plausible, and would work," says Mazziotta.

at all, but one of them will fail less spectacularly than the rest. You save that one, and make 1,000 mutant variants, randomly changing a couple of bits here and there in the mother program. Then you test the second generation. If you continue to repeat the process thousands or hundreds of thousands of times, you'll end up with a very efficient list-sorting program.

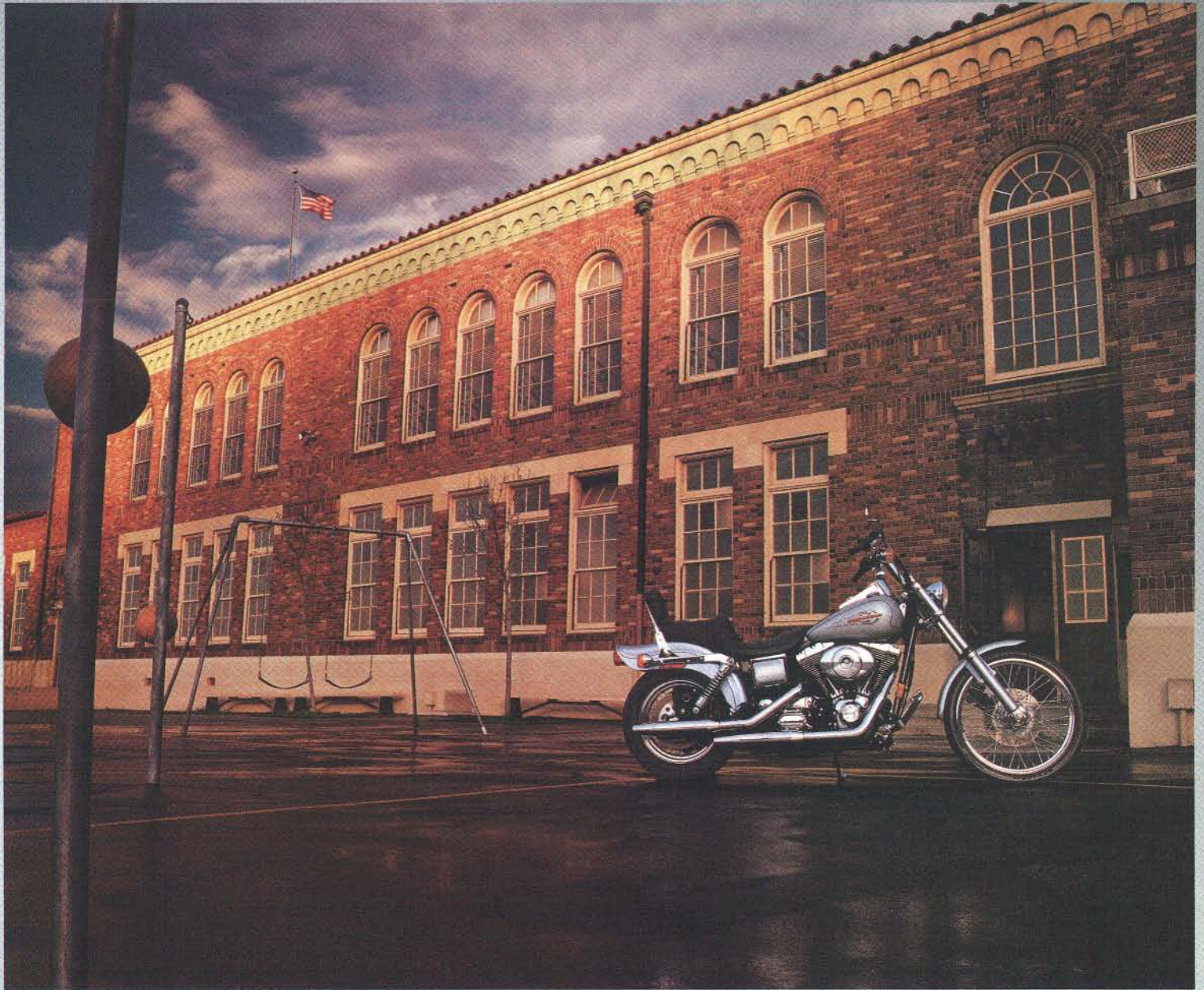
What Mack and two colleagues want to do is create programs that can reproduce

lating artificial environment will do the trick. "Kevin's taught himself enough to do it in a way that's quite plausible, and would work," says Mazziotta.

Which is, of course, Mack's style. Don't pause to wonder whether you'll pull it off - just dive in. ■ ■ ■

Contributing editor Mark Frauenfelder (mark@well.com) wrote "Gross National Product" in *Wired* 7.06.

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An aerial photograph of a vast agricultural field, showing deep, parallel furrows in the soil. The lighting is dramatic, with a strong orange and red glow, possibly from a low sun or a specific light filter. In the lower right quadrant, a tractor is visible, moving through the field and leaving a fresh furrow behind it. The overall scene conveys a sense of scale and the traditional nature of farming.

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You could trace the downloadable-media revolution back to 1987, when Germany's Fraunhofer Institut Integrierte Schaltungen joined with Dieter Seitzer, a computer scientist at the University of Erlangen, to devise a method for broadcasting audio in a compressed digital form. Their work produced a powerful compression/decompression algorithm, or codec, that could shrink sound files without forfeiting quality. The Moving Picture Experts Group, under the International Organization for Standardization, approved the technology in 1992.

But the innovation – MPEG-1 Audio Layer 3, or MP3 – didn't begin wreaking havoc on the recording industry and keeping copyright lawyers up at night until 56K modems became standard PC hardware and the Pentium broke the 300-MHz barrier. Suddenly, you could download an entire song in minutes. And it was college students, ripping songs from CDs, compressing them, and posting the files on the Web, who proved that MP3 might transform the industry and establish an entirely new way to buy, sell, and distribute music.

Today, record companies are beginning to embrace this potentially lucrative new business model, exploring ways to protect the artist against piracy and maintain control over distribution – the bread and butter of Big Music. Still, the five major labels have yet to post songs for download on their sites. Sure, they've been streaming new releases for years, but those files can't be saved on the recipient's hard drive, and most Net connections are so slow and the fidelity so poor that it's hardly worth listening in.

While the labels ramp up, the tech industry has jumped forward, developing dozens of new codecs, some even speedier than MP3. Software companies are marketing sophisticated audio apps like RealJukebox, and hardware makers are spitting out portable players. Web retailer Amazon.com offers sample MP3 and Liquid Audio downloads. MP3 Web sites have proliferated, too, linking artists with consumers and circumventing the record labels altogether.

Indeed, digital music is a natural fit for the Web. Already, thousands of music downloads are available for free. Soon, the recording industry will enter the game with payment schemes that'll let you choose songs from almost every artist and create your own custom jukebox. Then, as cable modems and DSL connections become commonplace, fiber crosses the last mile, and codecs get more advanced, downloading music videos, TV shows, and even feature films will be a part of our everyday Net experience. We'll use the word "download" as readily as we say "catch" a movie or "pop" in a CD. MP3 is merely the opening act. – *Michael Behar*

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Your tear-out guide. Begin download now.

BACK TIME!



A **WIRED**
SPECIAL REPORT
ON DOWNLOADABLE
MUSIC, VIDEO, AND MORE

Follow the Music

THE MONEY TRAIL

Retail Sites

Retailers (*cdnow.com*, *amazon.com*, *samgoody.com*) offer digital song files directly to customers. Record companies partner with ecommerce sites to sell music in proprietary formats or via approved third-party, copyright-friendly codecs, including Liquid Audio, a2b, or MS Audio. Playback devices are compatible with all the major codecs.

Portal Sites

Portal sites (*audible.com*, *broadcast.com*, *realnetworks.com*) aggregate audio and video from hundreds of sources, including music, television, and film, for both downloading and streaming content. The latter is generally free, but download requires a onetime licensing fee. Watermarking helps content providers track piracy.

Hardware Manufacturers

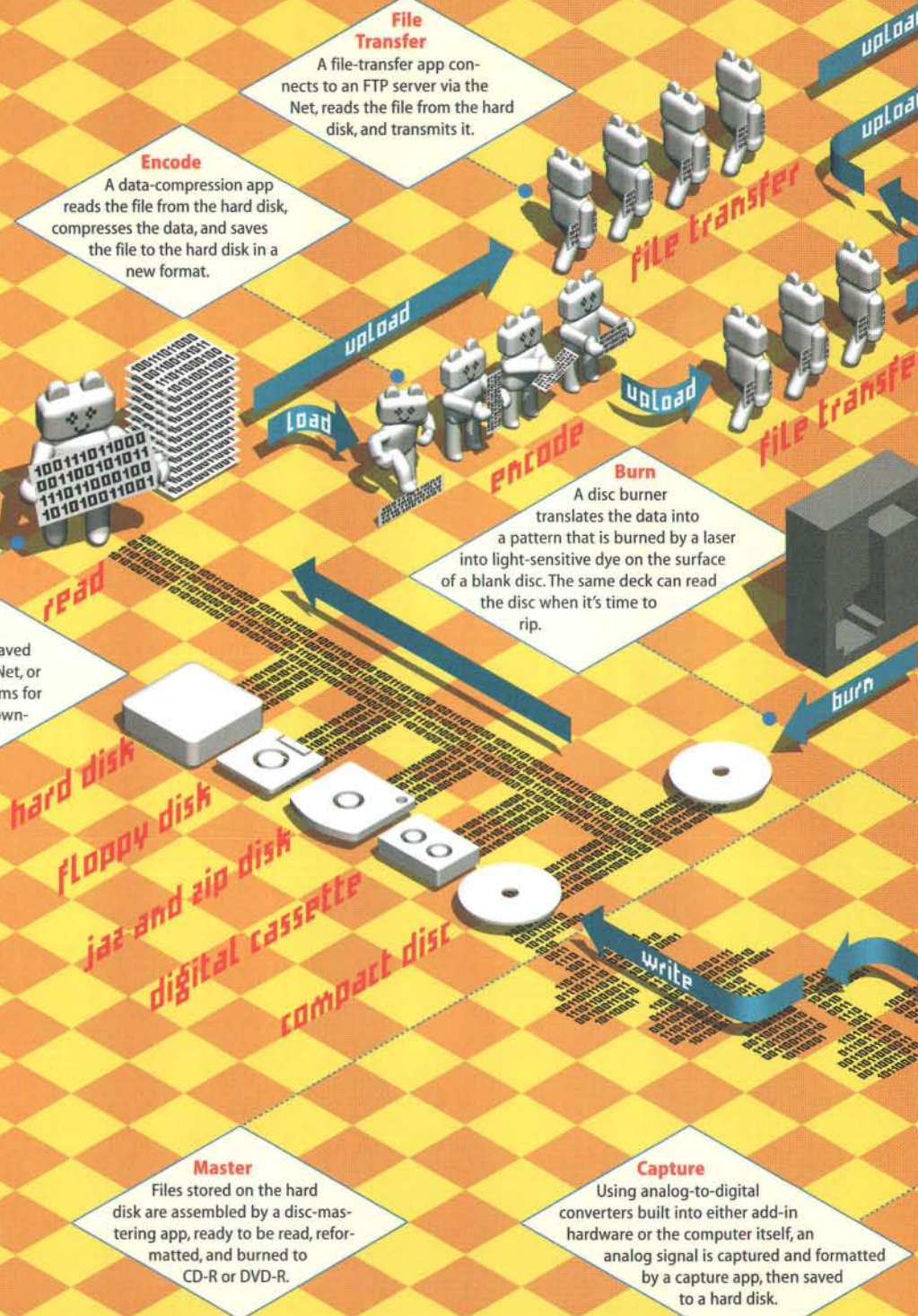
Manufacturers (Diamond, Saehan, Samsung) produce portable audio and video players that connect directly to the Net – sidestepping a PC. As bandwidth gets better and codecs improve, consumers will download full-length feature films (*clickmovies.com*) to home theaters, portable devices, and auto entertainment systems.

Record Company Sites

Major labels (*polygram.com*, *bmg.com*, *virginrecords.com*) offer “memberships” – for a fee, consumers can download a fixed number of songs for playback on a PC or a portable device or to be burned onto a CD. Audio files are distributed in proprietary codecs that include watermarking to track piracy and encryption to limit the number of times a song can be copied and played.

Artist Sites

Artists (*beastieboys.com*, *aerosmith.com*, *therollingstones.com*) sell CDs and singles as digital files directly to consumers, who can download music in several formats, including MP3, Liquid Audio, a2b, MS Audio, or G2. Copyright protections are built in with watermarking, and songs can be played on several new hardware and software devices. Customers can also listen to samples in streaming audio before buying.



THE ETUNE IS GOING PLACES

BY TED GREENWALD AND MICHAEL BEHAR IMAGE BY MAX KISMAN

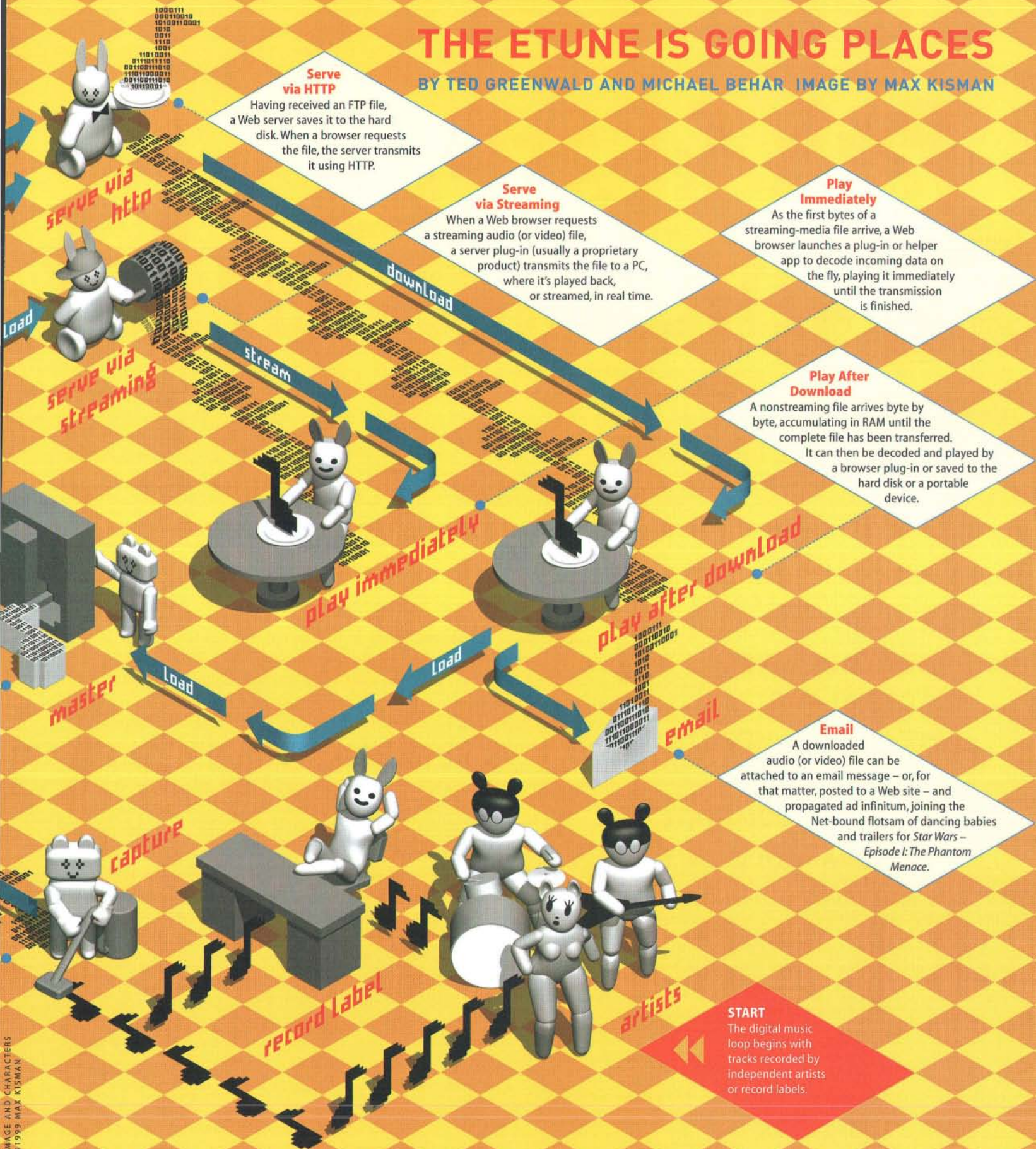
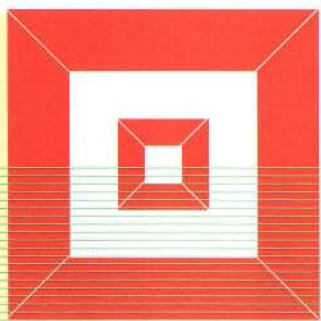


IMAGE AND CHARACTERS © 1999 MAX KISMAN

Rob Glaser, Moving Target



► **THE MAN BEHIND THE REALPLAYER RACES AHEAD WITH REALJUKEBOX, HIS AGGRESSIVE SCHEME TO DOMINATE THE DOWNLOADABLE UNIVERSE.**
BY RANDALL ROTHENBERG

Here's what Rob Glaser knows: The dawning Era of the Download will change everything. So Glaser, founder of RealNetworks and the king-of-streaming who brought radio and TV to the Internet, is busy convulsing the status quo again, this time with a superficially innocent melody machine called RealJukebox. Introduced in the spring, RealJukebox allows users to download songs from the Internet to a hard drive, upload – or rip – whole compact discs at exceptional speed, and shift tunes seamlessly to a new generation of desktop, set-top, and palmtop devices that appear destined to send your CD changer to the Great Turntable

Graveyard. RealJukebox makes your individualized soundtrack available from den to dashboard, from living room to jogging path. It's being hailed by some in the music and tech industries as the first step toward a literal "jukebox in the sky," meaning a networked device that can hook a listener up to any tune, anywhere, at any time.

Here's what else Glaser knows: The downloadable revolution isn't simply about music. The current imbroglio over MP3 – the compression algorithm that has turned digital downloading into a populist enterprise – is a preview of a larger battle over the convergence of all media, a looming phenomenon that promises to overturn the economic underpinnings of manufacturing, distribution, retailing, communications.

Anything so disruptive is, ultimately, about power, and Glaser is perfectly comfortable with that: His goal is nothing less than ruling the multibillion-dollar future of broadband. No wonder even his friends – record labels that use his technology to stream their songs, webcasters and portals that built their companies with his software – are convinced Glaser is going after them. Label leaders are accusing him of crossing the line into content kingmaking, major customers are blasting him for monetizing their property, and his former employer and onetime



RealNetworks founder Rob Glaser shows off his balancing act at the Seattle Aquarium.

investor, Microsoft – Microsoft! – is denouncing him as a monopolist.

“Real is playing Microsoft 1985, and we’ve learned that lesson,” says John Paddleford, a program manager in Microsoft’s Streaming Media Division. “This isn’t about technology. It’s about politics.”

Rob Glaser built his streaming empire – 1998 revenues \$65 million, current market cap somewhere near \$4 billion – in no small part upon a mastery of the politics necessary to turn both giant entertainment conglomerates and scores of small Internet startups into a unified, interdependent “ecosystem.” Today, as broadband turns from fantasy into reality, he and his minions still hope to keep their partners happy, but are forging defiantly ahead regardless.

“It is a risk; there are entertainment-industry executives completely threatened by what this new world order will look like,” concedes venture capitalist and RealNetworks board member Jim Breyer. “But there will be a new world order. The innovative leaders adapt. The others disappear.”

WITH A RAPID ADOPTION CURVE, DIGITAL DISTRIBUTION OF MUSIC

COULD BE A \$3.7 BILLION BUSINESS BY 2007.

The furor over digitally downloaded music has as much to do with music as the Lewinsky scandal had to do with sex. Etunes are just the latest flash point in the convergence power struggle.

Because music crosses all ages, classes, races, and national boundaries, it looks likely to be the most potent magnet for attracting the average consumer to broadband, jump-starting the marketplace in a way neither AOL’s chat rooms nor Time Warner’s Road Runner ever could. As Glaser says, “With music, the mass-consumer product has been digital for years. It’s a product form where consumers have a well-established pattern of wanting to collect and own it. The capacity of devices to hold enormous amounts of music will just leap. All the factors are lining up to drive acceleration of broadband.”

The recording industry is simply the first to be overwhelmed by the phenomenon. Online music sales are expected to account for fully 8 percent of industry revenues within the next three years, according to Jupiter Communications. Jupiter’s analysts believe that most of those revenues will come from the online sales of physical CDs, with pure digital distribution – hindered by bandwidth limitations and competing standards – accounting for only about \$35 million in sales by 2002. Others, such as Web music distributor Internet Underground Music Archive, project a far steeper adoption curve, with revenues from digital distribution exceeding \$600 million in three years and reaching \$3.7 billion five years later.

Money on this scale – combined with the likelihood that a chunk of all “hard media” sales and rentals, currently worth about \$60 billion annually, will shift to digital download – has drawn a diverse pack of competitors: tech giants IBM and AT&T, the five major record companies, conventional media operations such as MTV, tiny companies like MP3.com and Liquid Audio, and, of course, Microsoft.

Glaser has been on a tightrope each step of the way, attempting to placate and at the same time outpace the other players.

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When I first meet him, Rob Glaser seems an unlikely aerial artist. At 37, he is a heavy man with a thick handshake and a habit, much joked about inside his company, of showing up later in the morning than tech-industry workaholicism deems appropriate. Yet three weeks before the release of RealJukebox, he displays the kind of physical dexterity and mental agility that is, quite literally, breathtaking.

Glaser darts from meeting to meeting, stopping long enough to dictate a press release from his head and flip through a deck of graphs to rewrite a forthcoming speech, also on the fly. “You have the same data on three different slides,” he complains to an aide. Although I have been warned about his temper – “intense” is the most frequent word associated with him, but one former colleague more frankly labels him “a screamer” – I never hear him raise his voice, but I frequently hear him (especially later in the day) shift his already rapid cadences into warp speed, with an occasional profanity signaling deep displeasure. In one session, where a development team is showcasing an alpha version of RealJukebox sans a search function it is supposed to have, Glaser starts complaining. “It’s not supposed to be a stale page. It’s a fucking dynamic page. We’re doing press tours at the end of this week.

Anyfeatureyoudon’thaveforthelaunchtourdoesn’texistasfarasthe pressisconcerned!”

On this day in April, he is not only supervising the forthcoming launch but nimbly trying to keep his fractious ecosystem from devouring him. He has just disclosed a partnership with IBM to facilitate the secure distribution of digital music, a venture lauded by the major record labels, so right now, the entertainment conglomerates are happy. His task is to keep them content when they learn, today or tomorrow, that he is acquiring Xing Technology, which makes players and encoders for the notoriously insecure, deeply hated MP3.

“Are we clear on the messages to the various people we’re talking to?” Glaser asks at a morning meeting of his top lieutenants, convened to position the various download deals. On a whiteboard are scrawled the names of partners who need a talking-to: Sony, MP3.com, IBM, Warner, the Recording Industry Association of America, and so on. Most are members of the Secure Digital Music Initiative (SDMI), a coalition headed by the major labels to bless a single pirate-proof standard by which music can be digitally and profitably delivered.

The diplomacy is delicate. The deals are vital parts of a strategy aimed at ensuring that Real and its Jukebox are compliant with the SDMI standard. Provoke the labels too much, and they might just as readily withhold their blessing – or, worse, bestow it solely on Microsoft. “Our line here,” Glaser continues, “is that unsigned artists are a legitimate sector.” Translation: Stress that digital downloading is nothing more than a great and unthreatening way for would-be rock stars to get themselves known; don’t stress that it is also a great and threatening way for people to distribute pirated music.

Although Glaser admits only to “bumps along the road” in Real’s relationship with the labels, in fact more than a few people are furious with him. “Their Jukebox is a great way for people to make personal collections of pirated music,” one recording executive says. His warning to Glaser: “Don’t bite the hand that feeds you.” But Glaser, who for

months has spoken in conciliatory tones about the piracy problem, now, on the eve of the RealJukebox launch, has grown more aggressive. "Are car manufacturers responsible if someone drives over 50 miles an hour?" he asks testily.

The product of a suburban New York prep school favored by apostates and liberals, a prominent campus rad who penned a *Yale Daily News* column sympathetic to labor, Glaser may have seemed like an atypical Microsoftie. But having managed during his undergraduate years to gain three degrees (two in economics, one in computer science) and run a videogame company, he was primed upon his graduation in 1983 to blend with an ethic that was all about workaholicism. In a period when Steve Ballmer, then as now Bill Gates' chief subordinate, would survey the parking lot on Saturdays to see who was present, Glaser invariably was. "Even though Rob is an independent guy, it was really important for him to fit into that culture," recalls Mike Slade, who came to Redmond at the same time as a newly minted MBA. "There was a while when his attitude was almost 'Microsoft, right or wrong.'"

But in 1993, after rising to become the company's youngest vice president and gaining a reputation as a demanding boss, Glaser lost a bureaucratic tussle over control of the company's multimedia operations to Nathan Myhrvold, prompting Glaser to resign.

With a Yale friend, David Halperin, Glaser hatched vague plans for a company that would link television to the nascent Internet in the service of progressive causes. He'd heard of a new technological construct that would allow the transmission of real-time and on-demand audio signals over the Internet without making users suffer through interminable waits. Glaser, with some of his Microsoft millions, quickly hired a trio of engineers to develop the software. "Streaming" media would, he assumed, help make his new company, then called Progressive Networks, "a place where people who wanted to change the world could go," recalls Halperin, now a speechwriter for President Clinton.

Not long after, the two demonstrated the system to an informal group of liberal advisers at a Washington, DC, hotel. "We've developed a proprietary technology that I think will be critically important to our goals," Glaser told them. He opened up a laptop, called up a server in Seattle, and clicked the mouse. Within a few seconds, a baseball game started coming through loud and clear. Then and there, his friends convinced him to drop the politics, focus on streaming, and donate the resulting profits to their favored causes.

But streaming media had no clear, linear business model, no explicit strategy showing how it would generate consistent, ongoing profits. Glaser and his cronies veered through several notions – content models based on books-on-tape and premium cable television, for example – before realizing that they had, in fact, created a software company.

The idea – giving away the client player software and charging would-be new media moguls for the server software – entailed no small risk. In 1995, multimedia was, to many, a specialty application, not the future of the Internet. Glaser's friends were betting more on him than on the product. Lotus founder Mitch Kapor and Mike Slade, who'd left Microsoft to join Starwave, were early investors. Kapor also introduced Glaser to the venture capital firm Accel Partners. Glaser, who retains 40 percent of his company (currently valued in excess of \$1.5 billion), sold more than 10 percent to Accel for \$5 million.

Though the company's revenues remain paltry and its profits

nonexistent, the faithful have been rewarded both by shares that have risen almost tenfold since the public offering in late 1997 and by the satisfaction of seeing Real's technology achieve near ubiquity. Real-Networks (the company changed its name in 1997) estimates that more than 300,000 hours a week of streamed content are available on the Web, and its own RealGuide aggregation site lists 4,700 sites deploying live or on-demand streaming. In fiscal 1998, software licensing fees – primarily from server software – were \$47 million. Eighty-five percent of streaming media broadcasts, Real says, use its technology – a claim no one disputes.

Bill Gates, who had spent most of Real's first few years ignoring the Internet, eventually came to understand that his former protégé was on to something – something he wanted.

The tip-off came in 1997, when video seemed the next streaming opportunity and VXtreme, a California startup that had developed an early video-streaming technology, released its client software. Although widely considered the best system around, VXtreme had trouble attracting financing. "The issues were always the same: How many clients have you distributed?" recalls Pete Mountanos, then VXtreme's CEO. "We were winning every technical shoot-out; we were being distributed for free on the CNN site; we got to a million clients in a week. But Real had about 13 million. We were always going to be number two." Mountanos hinted to Glaser that he should buy VXtreme. Glaser, only months from releasing his own video product, turned him down.

Then, just before Father's Day, Glaser and Accel's Jim Breyer independently heard that Microsoft was on the verge of a VXtreme deal. Microsoft had been a laggard in the streaming space, but Real execs understood that with VXtreme's technology and the distribution reach of Internet Explorer, Microsoft was becoming a terrifying competitive threat. Breyer and Glaser quickly arranged a Friday evening meeting with two Microsoft senior executives, Paul Maritz and Greg Maffei.

"We knew that Microsoft would eventually become a major competitor, but without a relationship we thought we were in danger of not achieving ubiquity," Breyer says. "It was a question of which was the riskier strategy – completely removing ourselves from the Microsoft world, or trying to work with them."

Real decided that working with Microsoft was marginally less risky. A strategic alliance was quickly cemented, which allowed Microsoft to license, for \$30 million, Real's version 4.0 source code and bundle the client with Internet Explorer. The source code would enable Microsoft to make software capable of playing and serving the enormous amount of Web content available in Real's format. Microsoft spent another \$30 million for a 10 percent stake in Real.

Inside Real, the union was no cause for celebration. "It was a shotgun marriage," Kapor says. "It was tactically important to prevent all-out warfare."

What happened next is murky. Microsoft insiders say the company made an honest effort to work with Real, but that the quick flurry of deals caused organizational chaos. Real insiders describe the rise of a faction at Microsoft intent on using the technology license to undermine its new partner. Whatever the truth, shortly after the license took effect, Microsoft released its own, free version of the Real server – but with no limit on simultaneous streams. It was a killing blow to Real's main revenue source. "Once they did that," Glaser says, "they were signaling, not necessarily in a rational way, that they were focused on cutting our oxygen supply."

Glaser says Real had no choice but to retaliate by releasing, about six weeks later, its RealSystem 5.0, an updated format incompatible with the technology that Microsoft had just licensed. "It was a 'ha-ha' to Microsoft – 'you've got our source code, but we have something different,'" says a customer of both companies.

If nothing else, Glaser's action was shrewd, setting Microsoft back several months and giving Real a boost in the race toward ubiquity. By introducing an incompatible system, Glaser was ensuring that multimedia distribution would turn into a VHS-vs.-Beta standards battle, with Real, at least temporarily, holding the VHS card. In other words, the company was guaranteeing that any content introduced in its new format wouldn't play on the Windows Media Player – which made it less likely that paying server customers would defect to Microsoft, even for free server software.

With the release of the RealPlayer G2 in July 1998 the tensions came to a head. Built to conform to a protocol called Synchronized Multimedia Integration Language (SMIL, pronounced "smile") – replete with a channel

THERE IS AN ASPECT TO GLASER AND MICROSOFT THAT YOU HAVE TO

GO BACK TO GREEK DRAMA TO UNDERSTAND.

bar and a search tool, and capable of calling up streams in

the absence of a browser – G2 brought the company's vision of transaction-enabled multimedia closer to reality. But some PC users who had both the G2 player and Microsoft's equally new Windows Media Player 5.2 would be defaulted straight to Media Player. If the content called up was in Real's 5.0 or G2 format, the user would get an error message. In a few cases, Windows disabled G2 entirely.

As Senator Orrin Hatch, chair of the Senate Judiciary Committee, pressed Glaser to testify about Microsoft at his upcoming Competition in the Digital Age hearings, a debate raged inside Real. Some weren't really sure that what appeared to be happening was systematic enough – or clever enough – to be intentional; Microsoft's attitude, these people believed, was bureaucratic inertia, not willful subversion.

But Glaser grew increasingly convinced that Microsoft was intentionally slamming his clientele. He agreed to testify. He sent a last-minute email to Gates, offering "to share with you in advance what I'm likely to say." Gates' reply: "When you are in Washington, I suggest you visit the National Gallery and the Smithsonian."

Glaser was furious. For several people close to the situation, this exchange epitomized the complicated, residual personal relationship between Glaser and his former employer. Some say that among the factors driving Glaser, even now, "approval by Bill is one," as a partisan puts it. Gates' blithe response also strengthened Glaser's belief that Microsoft was intentionally punishing its defector. "There's a kind of aspect to Rob and Microsoft that you have to go back to Greek drama for," Mitch Kapor says.

Glaser himself raises the psychological issue frequently. "We're still dealing with this on an Oedipal level," he says at one point. He starts another salvo against Microsoft with, "In the annals of Oedipal or other obsessions ..."

"Does 'Oedipal' work both ways?" I interrupt.

Rob grows indignant. "No! Our business strategy isn't reactive. Everything we do is to move forward, to drive our business forward, to drive the medium forward."

On July 23, 1998, dressed in a gray suit and speaking in sober yet angry tones, Glaser told the Senate, "I believe Microsoft is taking actions that create obstacles to the freedom and openness of the Internet." Windows Media Player, he claimed, "breaks our product." He demonstrated how attempts to call up RealVideo streams from CMPnet and RealAudio from NPR were met with error messages when both RealPlayer and Media Player were loaded on the same PC. "What Microsoft is doing is wrong and must be stopped," Glaser insisted.

The reaction, though, was not what he or his executives expected. Microsoft officials responded that the first time they had heard of the problem was during Glaser's testimony. Moreover, Microsoft claimed, the flaw was with Real's technology, not its own. The breakdowns resulted from Real neglecting to inform Redmond about changes between the alpha and beta versions of the G2 player. Further, in upgrading RealPlayer, Real didn't change the file extensions. So a Windows player configured for earlier Real data would attempt – and indeed fail – to play the newer material. "That's why we were flabbergasted, because it worked the way we shipped!" says Gary Schare, lead product manager for Windows Media Technologies. "They broke it."

Glaser has put out a few faint feelers to Microsoft since the meltdown.

He sent an email to Gates lauding his support for Third World vaccination programs, but received no response. He also sent Ballmer a note congratulating him on his appointment as Microsoft's president, and offered to chat about "moving the RealNetworks-Microsoft relationship in a more positive direction." Ballmer thanked him but, says Glaser, begged off.

Meanwhile, Glaser's Senate testimony, test results, and supporting statements from other technology executives remain on Real's Web site. But Kapor, for one, concedes that Real made a strategic error: "We did not vet and check out the technology issues fully enough, and therefore went out with an exposed position that, while not wrong, wasn't defensible in the terms we presented. That's where we got hung out to dry."

And how. Real's stock plunged from a split-adjusted 22 1/8 a share on the day of Glaser's appearance to 16 5/8 the next day; by last September, it had sunk as low as 8 3/4.

"It was a difficult period," says Kapor, "but I wouldn't say it was a low point. People weren't demoralized." By then, the Realists understood that they were involved in something larger than a battle over clients and servers. They were engaged in a war for platform supremacy.

There had always been a method behind the madness of Rob Glaser's original software giveaway. His intent, inchoate at first, was to create a virtual platform.

"A virtual platform," Glaser explains, "isn't necessarily an operating system, although that can be an embodiment of it. It's looking at all the elements that are associated with a system in a networked world – in this case, a media-delivery system – and trying to assess how you coalesce a sufficient set of them to get critical mass."

Glaser had learned the importance of such standards on a Microsoft project. The Optical PC was a joint venture between IBM and Redmond to craft a cheap desktop computer with sound, video, and a CD-ROM drive built in. But the \$1,500 machine that was supposed to ship in the summer of '90 turned into a \$6,000 machine that didn't ship until a year

later – “a total irrelevancy.” Faced with abandoning the project and, with it, Microsoft’s hopes for multimedia, Glaser’s team took a different path. They seeded the marketplace with CD-ROM software (most prominently the Encarta encyclopedia) that they thought might drive consumers to demand inexpensive multimedia computers, as well as the software standards and development apps to support them.

“We got enough people drinking the Kool-Aid at the same time to create a virtual standard,” Glaser says. “That’s why computers today have sound cards, video cards, and CD-ROM drives as standard equipment.”

When he started Real, Glaser was obsessed with getting his users to drink RealNetworks’ Kool-Aid – even to the point of doing something many inside his firm deemed heretical. He required users downloading



the free player software to provide their names, addresses, and email addresses. The idea provoked fierce debate inside his tiny company. The engineers, in particular, considered it rude, a violation of netiquette. Glaser went ahead anyway – “by fiat, not by logic,” he says today. “I was influenced by Esther Dyson’s argument that in a networked economy, you don’t sell; you build a relationship. I believed that if people were inviting us to take up a megabyte on their hard drives, they were inviting us into a relationship.”

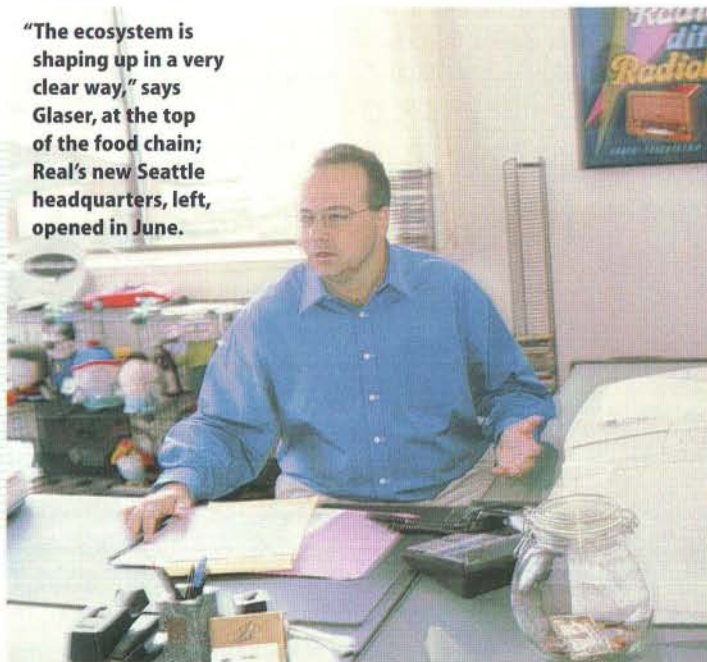
That thought was validated in ’96, when Glaser, again defying most of his senior advisers, tried to “upsell” his audience on an enhanced RealPlayer – essentially the same product, but with a few extra features – for \$29.95 a pop. More than a million copies have been sold.

The sales helped Real’s profit margins and crystallized Glaser’s thinking about business models. To him, a business model is not linear or static, but an almost fluid, three-dimensional object. It may start with a single product, but it rapidly envelops the consumers who use it. As other companies form to serve this audience, opportunities arise for the original firm to service the newcomers. Glaser likes to call this process “bootstrapping” off the “substrate” – that is, leveraging an existing market ever so gingerly into a new one by assembling a growing set of partners around your platform.

True to the model, hundreds of businesses have been built on the foundation of Real’s client-server system. In May, RealNetworks’ annual

developers’ conference brought together scores of them – OZ.com, developer of a 3-D streaming animation system; ComedyNet, with its streaming library of stand-up routines; Sonic Foundry, with its multimedia application tools; Virage, the creator of software that can index and search video and still-image data; the GAYBC Radio Network, a web-caster devoted to gay and lesbian topics. Most Real-based businesses are small and struggling. Some are anything but. A firm called AudioNet started up to host streaming audio for sporting events. Its relationship with Real was symbiotic; it spent millions on Real servers and drove countless listeners to download Real’s client, which in turn enabled AudioNet to become the first significant Web portal for multimedia content. AudioNet changed its name to broadcast.com and, this spring,

“The ecosystem is shaping up in a very clear way,” says Glaser, at the top of the food chain; Real’s new Seattle headquarters, left, opened in June.



was sold to Yahoo! for \$5.7 billion.

Toward the end of 1998, Len Jordan, Real’s senior vice president for media systems, gave this business model a name: He called it an ecosystem – a term Glaser enthusiastically adopted and voices incessantly. “It’s just pushing the ecosystem forward,” he says during one of my visits, discussing an acquisition. At another moment, considering a pending deal, he muses, “The ecosystem is shaping up in a very clear way.”

It’s a canny term that camouflages the darker side of Real’s strategy. For while some creatures flourish in an ecosystem, others must die. To keep RealNetworks among the survivors, Glaser has had to ensure that, within its ecosystem, his company sits at the top of the food chain. “No one wants to leave their destiny in anyone else’s hands, no one really knows how it’s going to sort itself out,” explains Bruce Jacobsen, Real’s former president. “So, do I want to have no play in a place that might be a huge strategic benefit?”

In its early years, Real was hindered from invading others’ turf by its single-minded focus on streaming and its need to protect its server-side revenues. While Glaser began to look longingly at, for example, the audience broadcast.com was attracting with his technology, broadcast.com president Mark Cuban was able to “keep the company at bay” by using its server purchases as a shield, says a former Real staff member. “Whenever Real said, ‘We’re thinking of going into aggregation,’ Mark was good at saying, ‘Don’t compete with me. I can go over to Microsoft.’”

The introduction of the RealPlayer G2, however, put new energy behind Real's casual rapaciousness. Len Jordan frankly calls the G2 player "the *TV Guide* and the channel changer for 400,000 sites; when the world becomes 4 million sites, that role becomes more important" – not least because Real intends the G2 to become an essential part of the architecture of broadband multicasting. "Any convergence that takes place will eventually depend upon a standard platform," says Martin Dunsmuir, Real's general manager of emerging technologies. "We want to have G2 players in television sets. We want to have G2 infrastructure components in the ISPs, whether DSL or cable."

These plans have allowed Microsoft to claim a kind of moral high ground. "Real isn't even a portal; it's a cul-de-sac – they don't want you to leave," says Windows Media Technologies' Gary Schare. "Microsoft's model is more pure. Our view is, 'You want Fox News, go into the browser, type *foxnews.com*, get the video. You, Fox, control the interface.' We're not interested in shoving our brand at you."

MP3 PROMISED TO CONSUME REALNETWORKS. TO SURVIVE, REAL

"Real," says Pete Mountanos, former CEO of V Xtreme, "is driving the content industry into Microsoft's arms. Quite candidly, Rob is acting like the old Microsoft."

But the flak isn't coming just from Microsoft and its supporters. One entertainment-industry executive calls Real's aggregation strategy "a mistake" because "if they want us to create traffic for them so their environment is compelling, at some point we'll be in competition with them."

Todd Wagner, CEO of broadcast.com, says that in his case, that's already happened. "I hate to use such an overused word," he says, "but our relationship with Real has turned into competition."

The most ominous peril to RealNetworks didn't emerge from Microsoft or the streaming marketplace, though. Instead it came from Germany, in the form of a compression/decompression standard, or codec, for downloadable audio clumsily named Moving Picture Experts Group-1 Audio Layer 3.

Downloading hadn't even been in Real's early strategic plans. The very idea of streaming was predicated on the knowledge that consumers got impatient waiting for large media files to make their way down a pipe. Real had, over time, incorporated downloading into various products – there was CD Streamer, an uploader, or ripper, of tunes from compact discs to hard drives, built by a fellow in Philadelphia using Real's software-development kit and sold on Real's Web site – but Glaser resisted calls to move formally into the downloading market.

Real's customers – especially the record labels that stream music samples to would-be buyers – hated downloadable music. Publicly, they worried that rampant piracy would cut into their revenues. Privately, they fumed over the threat to their economic hegemony if the music industry turned into a click-and-publish free-for-all. So Real stayed away. Angering Microsoft and broadcast.com was one thing; provoking the content owners was an entirely different matter.

But MP3, as the German codec was nicknamed, could not be denied. Thanks to the caliber of its compression algorithm – a CD-quality song

that took up 40 megabytes in a standard WAV file was only some 4 megs in MP3 – and with the easy terms under which its developers licensed it, MP3 raged across college campuses in 1997 and 1998. Students began using it to rip CD tracks and trade them across T1 lines. MP3's popularity was soon galvanizing scores of entrepreneurs and audiophiles to manufacture encoders, players, and portals around it.

It all felt uncomfortably familiar to Glaser. "They basically did what we did with our streaming players – put out free copies for anybody who wanted one," he says. "I wouldn't say they had a conscious plan to build a system around it, but it did unleash an organic phenomenon that's created a groundswell."

In other words, somebody else had created a virtual standard and an ecosystem – one that promised to consume RealNetworks, unless it got to the dinner table first. To survive, Real needed to co-opt MP3.

Around Labor Day weekend 1998, Glaser and his senior executives met to plot their strategy. The basic idea was fairly simple: Create a "software VCR" – an old, discarded concept of Glaser's – but with audio, not video, as its foundation. It wouldn't be a grand technological leap: It could be built atop RealPlayer's core. Like RealPlayer, it would be free. Ideally, it would play every major codec, including the dread MP3, so no

NEEDED TO GET TO THE DINNER TABLE FIRST.

consumer (and no potential ecosystem member) would get frozen out. And with Real's registered base of 61 million users, the company could guarantee getting the software into the public's hands.

But how would Glaser persuade those consumers to use this amazing new software and lure the record companies to start appealing and selling to this market – the core of any virtual-standard gambit? The "eureka," he says, was to integrate the CD scanner – "to use personal-use rights as the bootstrap" – and build software that would help people upload their own CD collection to their hard drives.

"The reason we were successful with RealAudio was the content," recalls Phil Barrett, Real's senior vice president for media technologies and long one of Glaser's closest colleagues. "We had lined up ABC News and NPR for the launch, and people came and got it."

They would do the same thing again. "Where's all the music content?" Barrett continues. "It's in people's own collections." If the company could persuade audiophiles to make a "behavioral change" and think of their hard drives as music-storage bins, RealNetworks could use MP3 to piggyback onto this new marketplace.

The strategy was the riskiest gamble Real could take. Microsoft had already considered and abandoned the idea of building a CD ripper, because, as one executive in the Windows Media Technologies team says, "we didn't want to come off as promoting piracy." Real was willing to hazard that perception. The record companies would be livid, to be sure, but by the time they or SDMI could do anything about it, there would be too many RealJukeboxes to ignore. Best of all, in their default mode the new players would encode CDs in Real's own G2 format – effectively transforming untold hours of music into something only Real software could translate.

"They realized that every music lover in America already has a titanic content library," says Don Brown of Qradio, Quincy Jones' webcasting venture. "What RealNetworks figured out is that if content is king, your living room is the palace."

The Digital WurLitzer

REALJUKEBOX'S FEATURES

RealJukebox, while not the only encoder, downloader, player, or management system for digitally delivered music, is the first piece of widely available software that can do all of the following:

- ▶▶ Play digitized music on a PC.
- ▶▶ Encode – or “rip” – digitized music.
- ▶▶ Download digitized music from the Net.
- ▶▶ Manage, arrange, and ease access to gigabytes of stored music.
- ▶▶ Purchase digitized music.
- ▶▶ Serve as the front-end software for a new generation of portable and set-top devices.
- ▶▶ Search for music on the Web.

The labels, when they heard the plans, were none too happy. To them, it seemed as if Glaser had attacked SDMI. They were quick to point out that they could retaliate. “What would happen if we put our music out, but it only played on our software player and we put those players on each of our CDs? That’s my question for Real,” says Larry Kenswil, the executive responsible for ecommerce at Universal Music, the nation’s top music label. “Why turn this into a war?”

Glaser’s response is to deny the problem and assume that the labels will act rationally – his highest praise. “If we can demonstrate that RealJukebox causes more CDs to be bought and more digital downloads to be purchased than would be the case if they didn’t work with us, then they will work with us,” he says.

In the fall, Glaser and his management team presented the RealJukebox project (back then dubbed Taiko, after the Japanese kettle drums that mimic the sound of rolling thunder) to the company’s board of directors. The team was prepared for the usual interrogation. “This time,” says Bruce Jacobsen, who was then Real’s president, “they said, ‘Ship it faster.’”

As RealNetworks’ stock price rose past 75 on April 1, a few programmers fashioned a wicked practical joke, writing and installing a program that scanned for a number following the company’s ticker symbol, RNWK, and automatically sliced it nearly in half. Anyone searching for Real’s stock price was confronted with a bloodbath. April Fool! In reality, the shares kept rising, past 120, and not long before the release of RealJukebox, Glaser mulled videotaping a “Real Rob,” one of his frequent streaming videos to the staff, to tell them to focus on their tasks, not their fortunes.

The real Rob, meanwhile, was still busy taking care of politics. He revised a speech he was due to give at the Internet World conference, in which he’d challenge the record labels publicly, for the first time, to embrace MP3. He orchestrated a slew of deals: an arrangement with AOL that would bundle RealPlayer on AOL CDs and let users “instant message” Real content links to their buddies, as well as a licensing agreement to provide software to GeoCities’ 4 million members to encode their own streaming content. He even managed a slight rapprochement with Microsoft, getting the RealGuide its own toolbar extension on Internet Explorer 5.0. And he got AT&T’s digital-distribution subsidiary, a2b, to license its secure format for RealJukebox.

Meanwhile the ecosystem kept evolving. Liquid Audio and MP3.com filed for initial public offerings. LG Electronics of South Korea publicized its forthcoming release of walkmanlike portables with MP3 playback added to the standard fare of FM radio and cassette play. And Glaser scrambled to complete arrangements with Thomson Multimedia for its own portable device, the RCA Lyra, to be powered by RealJukebox. He did the deal with IBM that designates RealJukebox as the interface for its Madison Project, an SDMI dry run, and bought Xing, the MP3 specialist. All of which prompted one influential analyst, Rob Martin of Friedman, Billings, Ramsey & Co., to predict that Real will break into the black by the end of this year with earnings of \$0.38 per share and to set a \$150-per-share price target.

But then Microsoft released Windows Media Technologies 4.0 with its download ability, super-clear codec, and rights-management protection. And Casio announced a handheld PC with a Microsoft-powered stereo built in. And Sony did its deal making Redmond’s Windows

Media Technologies its platform of choice. And Microsoft bought \$5 billion worth of AT&T shares, guaranteeing itself a place in a few million broadband set-tops. Apple came after Real too, announcing a free QuickTime streaming system. Taking a swipe at Real’s reliance on server-software revenues, Apple plastered advertisements for blocks around the RealNetworks conference in San Francisco that read: “Keep our streams free. No server tax.”

The day after Glaser recorded his stay-focused “Real Rob,” the stock began a rapid slide that would take it down to 64 a share – before it began an equally giddy glide back up in anticipation of strong earnings announcement and news that RealJukebox had been downloaded 1 million times within 10 days of its launch.

asked Glaser recently to project how his convergence quest will play out. “It depends upon what paradigm you’re on,” he answered. “If your view is that this is like the PC operating-system business, where everyone not the winner is a loser, then these competition dimensions are relatively nerve-wracking.

“But if, on the other hand, you think it will become more like the media business, where there’s ABC and NBC and CBS and Fox, where on Monday CNN can compete like heck with MSNBC, but on Tuesday Time Warner can give carriage on its cable systems to MSNBC, then it’s not winner-take-all. It’s an ecosystem, where everybody jockeys for advantage but has interdependencies.”

As we departed his cramped office, I paused by the aquarium and noticed that among its residents was a clown fish. Striped and placid, it is one of the few creatures that can live within the stinging tentacles of a sea anemone, which it did while I stared.

Later, I sent the RealNetworks founder an email asking him whether there’s any symbolism behind his choice of aquatic companionship.

“None that I know,” he wrote back. But he has clearly paid some attention to the relationship between the little critter and the deadly medusa. “While other fish stay away, I guess for fear of being eaten,” Rob Glaser told me, “the clown fish swims merrily in its midst.” ■ ■ ■

THE TOP 5

COUNTDOWN

CHARTING THE RECORDING INDUSTRY'S DIGITAL GAME PLANS.



Slowly, timidly, and a little begrudgingly, the major music companies are realizing that digital distribution won't go the way of the 8-track. MP3 opened a Pandora's box of piracy and profit issues that no amount of industry muscle can shut. For the sake of the artists and composers they represent – and their shareholders – the majors have recognized the need to jump into the game with clear strategies and quick reflexes.

It's early yet. SDMI (Secure Digital Music Initiative) is just warming up, and the rules of the market are being rewritten by high tech and consumer electronics rivalries. But as music-industry paranoia gives way to aggressive moves, look forward to cool stuff like custom compilations and multimedia liner notes. And watch for the reactors to become actors. – Rob Kenner



UNIVERSAL MUSIC GROUP

After parent company Seagram bought PolyGram in 1998, Universal (led by CEO Doug Morris) became the industry's 800-pound gorilla. Its roster includes A&M, Decca, Def Jam, Deutsche Grammophon, DreamWorks, Geffen, Island, Mercury, MCA, Motown, Philips Classics, Polydor, PolyGram, and Verve. Universal Studios controls movies and more.

"There's no way to combat music on the Web without a commercial alternative," says Universal Music Group exec **Larry Kenswil**.



BMG ENTERTAINMENT

Owned by Bertelsmann AG (and led by Strauss Zelnick), the BMG team includes Arista, Arista Latin, Arista Nashville, Bad Boy, BMG Classics, Jive, LaFace, Loud, RCA, and Windham Hill. Additional holdings include publishing, TV, software, and interests in Net companies such as AOL and Lycos.

"We've always been big believers in the Internet," says **Kevin Conroy**, the senior VP, who spins BMG's Web strategy. "I went to Strauss four years ago and laid out a vision, and he said, 'Go for it.'"

THE VISION

"The upside of MP3 is that it's exposing artists and creating a buzz about bands," says Kenswil. "The bad part is that it's an unprotected format. It eliminates all sense that people who work for a living writing and preparing this stuff should get paid.

"We need a digital distribution system that allows for hit records. Our dream is that digital distribution ultimately represents half the market. Basically, the marketplace doubles." Getmusic.com, an ecommerce venture launched with BMG last April, will command a dreamy 40 percent market share.

"The Internet's all about opportunities," says Conroy. "We've been actively involved in the creation of SDMI, and expect a legitimate market for digital distribution to begin to emerge in the fourth quarter of 1999.

"Less than 2 percent of releases are commercially successful. There's a basic marketing problem – the industry isn't connecting its artists with their fans. To me that says we need to use the Internet as a bridge."

BMG's Getmusic.com partnership with Universal increased the pool of digital content. BMG is also a member of the new EMD digital network initiative.

THE GOOD NEWS

In May, Universal partnered with InterTrust Technologies, whose DigiBox software provides copyright protection, supports SDMI standards, and allows for "tell-a-friend" distribution. Universal also established the vast EMD digital network along with AT&T, Matsushita, and BMG this spring.

"We might be slow in coming to digital distribution," says Arista executive VP Charles Goldstuck, "but that won't hurt our business. What will hurt our business is if we step too fast and find ourselves exposed without any way of stepping back. Instead, we'll see what the rest of the world does, and skip a few steps."

THE BAD NEWS

Universal – which distributes more than half a billion CDs a year – will have to invest tens of millions of dollars in a digital asset-management system just to make sense of its enormous inventory. "We have it on the very fast track," says Kenswil. "Unfortunately, the initial outlay is going to be immense."

The company's interests in CD and cassette manufacturing make it unlikely that BMG will adopt purely digital distribution.

THE TRASH TALK

"[Seagram president and CEO] Edgar Bronfman Jr. may be the visionary of Big Music, but he's also the guy who in 1997 dismissed the Internet as 'the CB radio of the '90s.'"

"Getmusic.com is going to do nothing. BMG was bleeding red ink and convinced Universal to write it a check. I don't know if you've ever been in a 50/50 deal where the partners don't trust each other or necessarily have the same goal, but it's not pleasant."

THE TAKEAWAY

If they can wrestle all that content into usable formats, these guys will be masters of the universe.

BMG's Web presence is OK, but it's the partnership with Universal that's yanked it higher in the standings.

HARMONIC CONVERGENCE

HOW WE GOT HERE AND WHERE WE'RE GOING: A MULTIMEDIA TIMELINE.



◀ 1436 Johannes Gutenberg debuts printing press in Germany.

1790 US Copyright Act establishes basic parameters of copyright in United States.

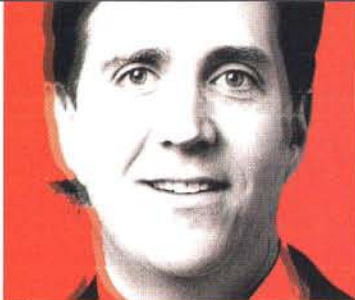
1841 *Folsom v. Marsh* introduces doctrine of fair use.



▲ 1844 Samuel Morse transmits first message by telegraph, from Washington, DC, to Baltimore.

1857 Transatlantic cable, laid by Cyrus W. Field and John Pender, connects US and Europe. ▶





SONY MUSIC

The Japanese giant's US music arm (run by Tommy Mottola) includes Columbia, Epic, 550 Music, Legacy, Razor Sharp, Refugee Camp, Relativity, Ruffhouse, Sony/ATV, Sony Wonder, So So Def, and Untertainment. Sony's interests span electronics, software, and information technology.

"We started strategic discussions in 1994," says senior VP **Fred Ehrlich**. "We're very happy with the progress we're making. But we're just in the beginning, far from the finish line."

"I don't like to make predictions in public," Ehrlich avers. "What I would feel comfortable stating is that 10 years from now traditional record stores will exist alongside virtual offerings."

"Just because you have the ability to self-publish doesn't mean you will be successful. Right now there are various sites, like MP3.com, that might have 10,000 artists. But how do people know who's on them? Record companies add tremendous value, and we will continue to add tremendous value."

Sony is partnering with Microsoft to sell and distribute music using Windows Media Technologies 4.0 this year. "Right now we're talking only about singles," says Ehrlich. "Over time, the expectation is to make a considerable number of titles available."

The last thing Sony Music needs is to get dragged into a format war. But word is that Sony Electronics is hoping to establish its Flash Memory Stick as the memory standard for portable digital music devices.

"It'd be one thing if Sony created a music brand, but it's building a corporate brand, and I don't know if that cuts it. It's sort of a portal strategy. But at the end of the day, if it's not hip, if consumers don't find it relevant, what's the point?"

Sony's dual interests – music and hardware – might clash, handicapping the company. Then again, they might come together to produce a dominant player.



EMI

Owned by the EMI Group (run by Ken Berry), the British power has relationships with Blue Note, Capitol, Caroline, Priority, Virgin, and EMI Classics, not to mention its dozens of international divisions.

"It's the most exciting time for the music industry since the birth of vinyl," says **Jay Samit**, EMI's senior VP of new media. "On a scale of 0 to 10, we're at 1 or 2. It's a long road. But our goal is to make it happen within 12 months. One hundred thousand songs online by Christmas? No problem."

"If you believe fundamentally in a creative culture," says vice president Jeremy Silver, "then you also have to believe in the right of those who create the cultural materials to be rewarded for that creativity."

"We're going to simultaneously try many different business models," says Samit, "and consumers will tell us by their actions what they like. We're thinking beyond the album as the sole model of how music is aggregated."

"EMI is the world's largest pure music company," notes Samit, a Net veteran who recently defected from Universal. "Other studios get mired down with all the competing divisions. But EMI can move quickly and really do things. It's like a startup that just happens to have giant market share and billions of dollars."

Samit may have the vision, but he just joined the team in April. The exec's spin that "EMI spent no money going down the wrong path" doesn't change the fact that the company is way late to the game.

"EMI is really nowhere – *nowhere*. The company was being sold, not being sold; they lost market share. They've got some things going on at individual labels like Capitol. But there's no company focus."

With good leadership and sharp focus, EMI is a dark horse to watch in the last furlong.



WARNER MUSIC GROUP

Time Warner's music division (led by Bob Daly and Terry Semel) consists of Atlantic, Elektra, Maverick, Reprise, Rhino, Sub Pop, and Warner Bros. Not to mention Time Warner's interests in movies, TV, cable, Ted Turner, and the Looney Tunes gang.

Executive VP **Paul Vidich** steers Warner's Net strategy. Execs spoke on the condition they not be quoted directly. Warner's most digital plans to date: Move the direct-marketing power Columbia House, owned jointly with Sony, into ecommerce.

Sure, once bandwidth increases and secure standards are adopted, digital distribution will be big, but for now company wisdom is that people don't want to experience the technology; they want to experience the music. Warner's near-term digital strategy amounts to DVD surround-sound audio discs. It sees the Internet primarily as a marketing tool, gathering consumer information and making the sale of CDs, DVDs, videotapes, and games more efficient.

Warner mainstay Tom Petty posted a free promotional track at mp3.com, generating lots of positive press. Fans downloaded more than 150,000 copies.

Warner talked Petty into ending the MP3 promo after two days. And Alanis Morissette's ongoing infatuation with MP3 has done little to calm the most paranoid Warner execs – the company's been dragging its corporate feet.

"Warner is run by movie guys. I don't know how much power the music guys have behind them. Also, Warner Music is very decentralized – the labels compete heavily against each other, and they don't like corporate guys telling them what to do."

Time's a-wastin'. Warner needs to adopt a few plays from Alanis' book.

IMAGES BELOW: CORBIS/BETTMANN; CORBIS/HULTON-DEUTSCH COLLECTION; ARCHIVE PHOTOS



1876 Alexander Graham Bell demonstrates telephone in US. ◀



1877 Thomas Edison records and plays "Mary Had a Little Lamb" on tinfoil cylinder phonograph. ◀



1894 Guglielmo Marconi transmits wireless telegraph signals. ▼

1895 Louis and Auguste Lumière project movies on a screen in public demonstrations in France. ▶

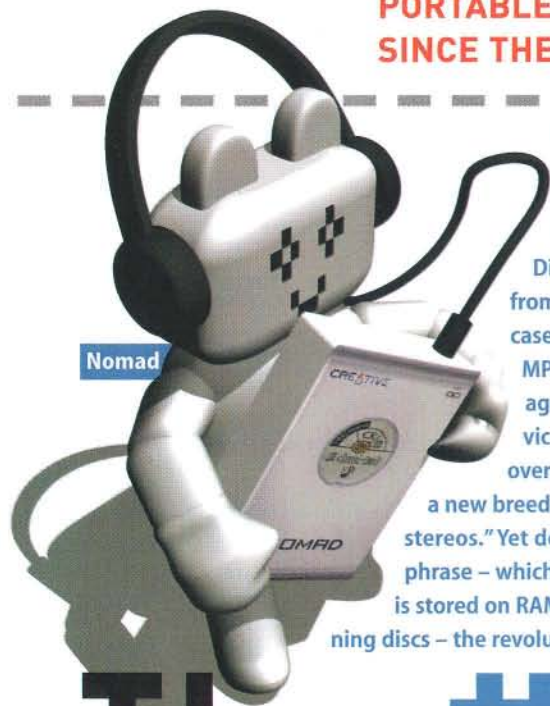
1905 Jukebox is introduced.

1909 US Copyright Act revised to address media categories beyond literature, especially music.



1931 Alan Blumlein invents stereo audio recording. ▶▶

WHAT YOU GET WITH THE HOTTEST PORTABLE DEVICES SINCE THE WALKMAN.



Nomad

Given all the pomp and circumstance, you might've thought that the graduation of Diamond Multimedia's Rio from precedent-setting court case to consumer-friendly MP3 player heralded a new age in music. The initial victory by the manufacturer over the RIAA did trumpet a new breed of "solid-state personal stereos." Yet despite the new buzz phrase – which simply means that music is stored on RAM chips instead of on spinning discs – the revolution is still playing out.

Diamond Multimedia

Rio PMP300

Almost a year after its unveiling, Diamond's Rio PMP300 is beginning to show its age, both in terms of its dull, black appearance and its limited storage capacity. Using the built-in 32 megs of memory, the player stores only 30 minutes of CD-quality music, but removable flash memory cards (purchased separately) can be used to bump up the playback time. Rio PMP300: \$199; www.rioport.com.

Diamond Multimedia

Rio 500

The latest Rio packs 64 megs of RAM – upgradeable to 98 megs with flash memory – allowing for 90 minutes of CD-quality music. The 500 also supports Audible.com's

Pontis MPlayer3

Don't you just love the ergo-cool shape and those cute little removable flash memory cards with the Keith Haring-esque design? You'd better: The MPlayer3 comes sans built-in memory. While this scheme sounds a little impractical, Pontis is banking on forthcoming 128-meg cards to make this player sing. MPlayer3: \$195; www.mplayer3.com.

Saehan MP-F10

The Korean electronics company takes the prize for getting the most complete line of MP3 players to market first. The MP-F10 is the entry-level bad boy, featuring 32 megs of RAM, expandable to 64. MP-F10: \$179; www.mpm.com.

The MP3 Players

Enjoyed at the gym because no moving parts means the cigarette-pack-sized devices don't skip, Rios are slowly attaching themselves to spandex-clad stairmasters. But the industry that battled to keep the Rio out of weight rooms – and everywhere else – is still fighting to curb the spread of players that don't explicitly guarantee copyright protection.

In the meantime, copyright squabbles aren't slowing the slew of competitors. Samsung released a line of players in Korea this past spring, with the promise of a stateside invasion later in the year. Creative Labs unveiled the Nomad earlier this summer. Thomson Multimedia is building a portable player for RealNetworks' RealJukebox G2 player. Car decks have been announced. Other manufacturers are working on less portable MP3 stereo components. Simply put, the promise that all music will one day be in a universal digital format, distributed over a network to stand-alone audio players, has proved irresistible.

– Jesse Freund

codec for spoken-word programming. Available late 1999. Rio 500: \$269; www.rioport.com.

Creative Labs Nomad

Like the Rio PMP300, the Nomad sports 32 megs of built-in RAM, and you can boost that another 32 with flash memory cards. Creative Labs differentiates its player by including new features – including a voice recorder (holding up to four hours of audio), a snazzier LCD display, and an FM tuner – not to mention the oh-so-hip brushed-metal styling. Nomad: \$249; www.nomadworld.com.

Saehan MP-F20

The MP-F20 uses flash cards and 32 megs of built-in memory to provide 60 minutes of CD-quality music. Unlike the MP-F10, this tune toter includes a parallel port, freeing you from the docking station once and for all. MP-F20: \$179; www.mpm.com.

Saehan MP-F30

The latest Saehan player has more memory than the other RAM-based players – up to 128 megs – so you can take it on a 10K run and then some: It holds two hours of CD-quality music. It also comes with

1938 John Logie Baird transmits color television signal. ▶



1949 Jay Forrester at MIT invents magnetic computer memory. ▶



1951 Nagra's Stephan Kudelski develops portable audiotape recorder.

1952 Recording Industry Association of America is founded to represent interests of record companies.

1955 Narinder Kapany invents fiber optics in England. ▼



1956 Prerecorded, stereo, open-reel audiotapes hit market.

Video recording is developed in US by Ray Dolby and Charles Ginsburg of Ampex. ▶



remote-control headphones and an electronic memo feature for phone numbers or notes. MP-F30: price not available; www.mpm.com.

Saehan MP-H10

Now we're talking, er, listening – to a lot of tunes, that is. The MP-H10 comes with a 2.1-gig hard drive, meaning that in addition to its larger – but still portable – size, it can store up to 500 songs. Of course, with that much music, it's only natural that the power player also comes with editing software so you can create custom play lists. Available late 1999. MP-H10: price not available; www.mpm.com.

Saehan MP-CL10

The MP-CL10 underscores yet again the unresolved issue of removable media. Instead of flash cards, this player uses 40-meg Clik! Disks to store tunes. The advantage? Well, if you have a Clik! Drive it's pretty handy. Otherwise, it's yet another removable media to bother with. Available late 1999. MP-CL10: price not available; www.mpm.com.

Samsung Yepp E Series

Yup, the Yepp is cool – although you might consider spending the extra money for the B or D series instead of buying this entry-level model. While it does offer the basics in terms of memory and appearance – as well as a direct parallel port connection to a PC – you're missing out on the sexy magnesium case (see Yepp B and D). Available late 1999. Yepp E Series: approximately \$200; yepp.co.kr.

Samsung Yepp B Series

Yepp B has that cool magnesium look, but why it requires a docking station (while the E series doesn't) remains a mystery. And, like the E series, it offers a paltry 32 megs of built-in memory with no means for expansion. Available late 1999. Yepp B Series: approximately \$225; yepp.co.kr.

Samsung Yepp D Series

Yepp D is what you're looking for: magnesium shell and 32 megs of RAM, with flash memory cards for an added 32 megs. And Samsung throws in a digital FM tuner for good measure. Available late 1999. Yepp D Series: approximately \$250; yepp.co.kr.

Wired Global Communications CD^3

Hands down, the strangest MP3 initiative. This open-source project was started by five students at the DeVry Institute of Technology in Phoenix. Instead of storing MP3s in RAM, you use a CD burner to store MP3 files on a CD and then play the CD on the CD^3. That way, you can carry around 200-plus songs on this portable CD MP3 player. Prototype built, awaiting hardware manufacturer. CD^3: approximately \$399; cd3.wiredglobal.com.

BayCom GmbH

Oscar

A home-stereo component of sorts, this MP3 player is most definitely not portable. Instead, it features a hefty hard drive. You compress music files with a PC and

then transfer these MP3s to Oscar's massive hard disk. The advantage is that it stores 2,500 songs (six days' worth of music), so you never have to get off the couch. Limited availability. Oscar: \$410; www.oscar-mp3.com.

Lydstrom SongBank

MZ3-3500

Of all the would-be MP3 stereo components, the SongBank MZ3-3500 seems the most likely to find a place in your living room. Like others, it has a CD player that stores songs and supports MP3 files. But unlike the competition, its hard disk holds a whopping 3,500 songs. What's more, Lydstrom seems intent on taking the geek out of the MP3 experience by including a simple touchscreen remote, an interface that automati-



RaV6 Digital Audio Jukebox

Empeg Car

cally recognizes and labels tracks, and an intelligent agent that learns your listening habits and can play the songs you want when you want to hear them. Available late 1999. SongBank MZ3-3500: \$1,000; www.lydstrom.com.

Indigita RaV6 Digital Audio Jukebox

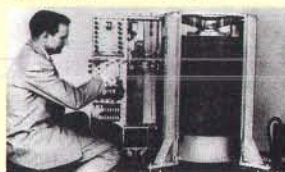
Basically, the RaV6 Digital Audio Jukebox is a DDS DAT backup system that has been retrofitted to handle MP3 files. This means it can hold 2,000 near-CD-quality songs and play them back on demand. MP3.com uses this system in-house to store up to 2,000 songs. RaV6 Digital Audio Jukebox: \$599; www.indigita.com.

Empeg Empeg Car

The Empeg Car sits on your dash and holds up to 5,000 MP3 songs (or 35 hours of music) in a 2.1-gig hard drive. This removable auto stereo includes an infrared remote, USB and serial ports for transferring music files, and four pre-outs for your in-car amplifier. It's decidedly geek chic. Empeg Car: \$999; www.empeg.com.



BM markets RAMAC 305 hard-disk drive, which stores 5 Mbytes on 50 disks 2 feet wide. ▶



1958 Stereophonic records are introduced.

1959 Xerox debuts photocopier.

1963 ▶ Philips demonstrates compact audiocassette.



Sony launches consumer open-reel videotape recorder.

1965 Eight-track audiotape cartridges developed by William Lear.

Computers at MIT and System Development Corporation in Santa Monica, California, communicate via 1200-bps connection.

1966 Xerox markets first fax machine.

1967 Ampex introduces the portable videotape deck.

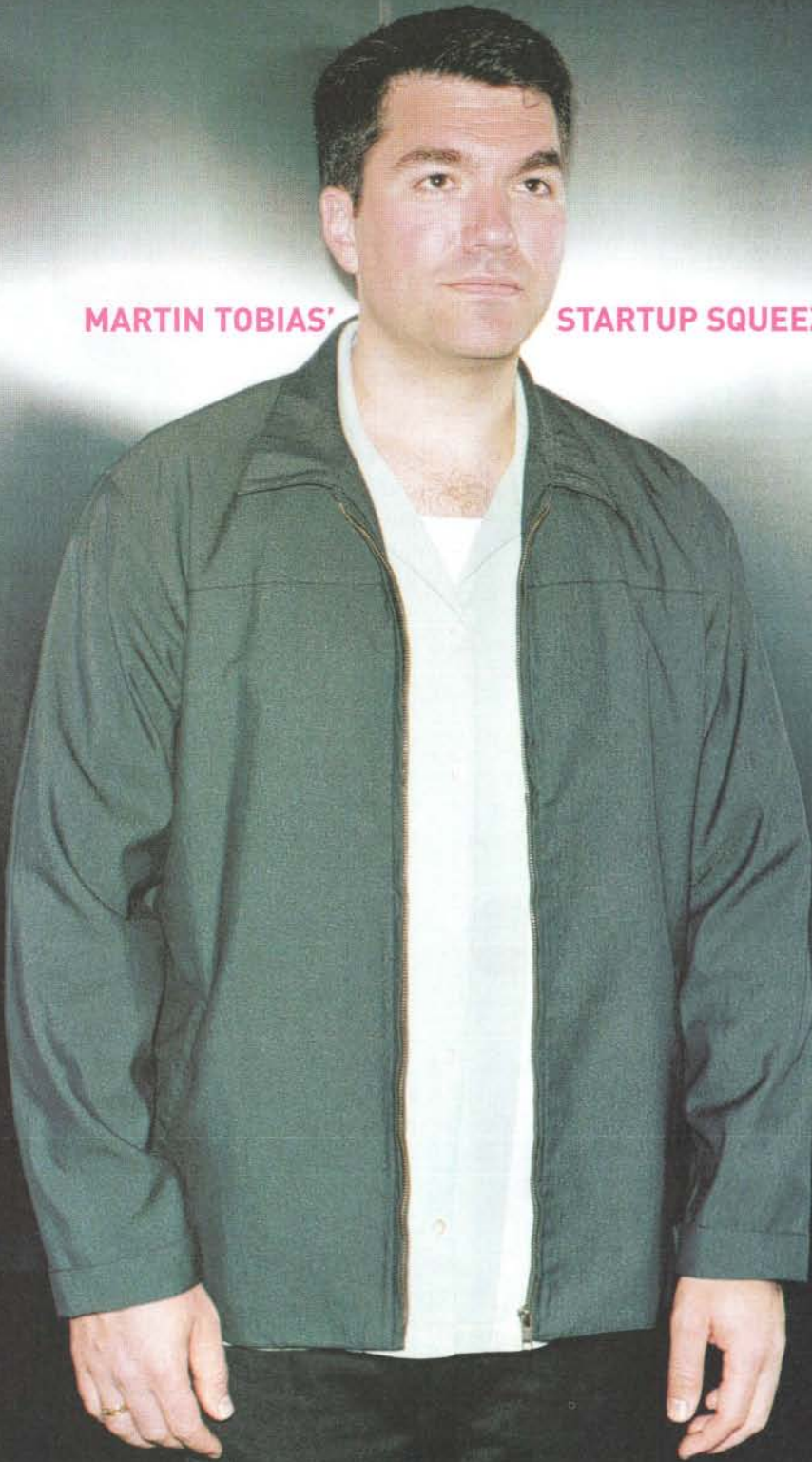
1969 Sony releases U-Matic videocassette in Japan. ▶

1971 Project Gutenberg begins digitizing major literary works.

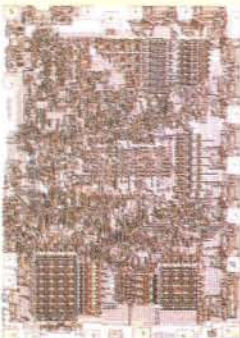


INSIDE

MARTIN TOBIAS' STARTUP SQUEEZES OUT SMALL FILES ON A GRAND SCALE.



IMAGES, BELOW: COURTESY; INTEL; COURTESY; SONY; ABOVE: KATHARINA BOESE



1972 Intel introduces 8008 CPU running at 200 KHz. ◀

1973 File-transfer protocol (FTP) specification is developed for uploading and downloading digital files between nodes on a network.

1974 Sony launches Betamax videocassette format in US.

1975 First personal computer developed, the MITS Altair 8800.

1976 Intel 8085 CPU runs at 5 MHz.

US Robotics markets Phonenk 300, a modem that operates at 300 baud.

VHS videocassette format launched by JVC.

Universal and Disney sue Sony for encouraging copyright infringement via Betamax.

1979 Walkman portable audio-cassette player introduced by Sony. ▶



ENCODING.COM

In 1996,

Martin Tobias was living a double life. During the week, he toiled as a mild-mannered Microsoft

marketing exec managing online software sales. But on weekends, he revved up his Harley-Davidson Fat Boy and thundered down the highway with a motley assortment of Seattle-area riders to work on *Biker Dreams*, a brash indie documentary that featured Tobias and covered the annual Harley convention in Sturgis, South Dakota.

"When we finished the film, we thought we should have a Web page and put a trailer on it," recalls Tobias. But he knew from his experience at Microsoft that a movie trailer on the Net would exact a heavy toll in download time from anyone who wanted to see it. Using even the most efficient video compression/decompression, or codec, technology and the fastest modem available at the time, a three-minute trailer would have taken over an hour to download.

Tobias had friends at RealNetworks, an Internet startup that had made a splash in 1995 with the first streaming-audio codec, RealAudio, which could play sound files over dialup Net connections in real time. The company, he learned, was working on a similar codec for video.

"At that time, I was wondering what I wanted to do with my life," Tobias recalls. "Actually, riding my Harley around was looking pretty attractive." Still, he thought, maybe there was a business in this. RealNetworks would supply the technology, telcos would supply the bandwidth, and media outlets would broker the content. But who would encode the thousands of video and audio titles into the necessary compressed formats? There would be no media on the Web, Tobias realized, without someone to digitize and encode it into files small enough to make downloading quick and easy over a Net connection at any speed. At that point, the entrepreneur in him shoved the biker into a sidecar, and Tobias set out to build

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BY TED GREENWALD

the ultimate digital-media service bureau, encoding.com.

Founded in July 1997 and still privately held, Tobias' Seattle-based company booked twice as many orders in the first quarter of 1999 as it did in all of 1998. The current client roster includes major media companies such as Sony, Warner Bros., and BMG, as well as Fortune 1000 companies like Cisco and new media ventures like Payperview.com. According to encoding.com marketing director Todd Sawicki, whose official title is Minister of the Medium ("the message is the medium," he quips), the company compresses 500,000 minutes of audio and video every quarter and can read 25 tape formats (everything from cassette to Digital Betacam) and suck data off 1,000 CDs at once, processing the contents into nearly 30 compressed formats.

Although *streaming* and *downloading* are often mistaken as interchangeable terms, in fact they're two very different things. Streaming gives Net users instant gratification but relatively poor playback quality (at least for video), and it does not capture the content. Downloading, which involves moving an entire file before any part of it is accessible, offers better quality and – fueling the piracy scare and a host of copyright concerns – deposits the content on your hard drive. Once it's there, you can do pretty much whatever you want with it.

Many encoding.com clients request a streaming format (such as RealMedia), a downloadable format (usually MP3), and a secure downloadable format (such as Liquid Audio or a2b). And almost all clients want files encoded at several data rates to accommodate connections ranging from 28.8 Kbps to T1. Moreover, each encoded file might be accompanied by a number of pieces of related information, or metadata, meshed directly with the file or stored in an accompanying database.

"Our biggest project to date, for one of the major record labels, started with 25,000 CDs," encoding.com's Sawicki reports. "They ended up as 600,000 audio files, as well as metadata such as the title,

IMAGES BELOW: SCOTT SUTTON/ARCHIVE PHOTOS; COURTESY MICROSOFT

1982
Philips and Sony introduce CD digital audio format. ▶



Intel 80286 processor runs at 6, 10, and 12 MHz, processing 16-bit rather than 8-bit words.

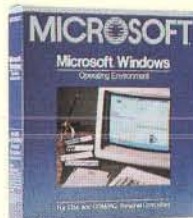
1984
Apple introduces Macintosh computer.
Number of Internet hosts exceeds 1,000.

Philips and Sony develop CD-ROM format with 650-Mbyte capacity.

Motorola 68020 CPU runs at 16 MHz.

Sony introduces Discman portable CD player.

1985
US Robotics Courier 2400 modem operates at 2400 bps.



AOL goes online.
Microsoft releases Windows 1.0. ◀

1987
DAT is introduced in Japan. ▼

Number of Internet hosts exceeds 10,000.

Fraunhofer Institute begins work on new audio codec, later formalized as MP3. ▶▶





Tightly coiled cable snakes down from the ceiling inside encoding.com's Seattle HQ (left); 60 dual 450-MHz Pentiums and more than 20 400-MHz G3s produce a million minutes of compressed audio and video every six months.

author, artist, copyright notice, and CD-cover image for each file."

Nearly 100 employees now work inside the company's \$2.5 million facility, a warehouse-style space situated in a former church whose facade has been painted black and festooned with a giant neon-purple logo. Black snakes of networking cable crawl across the 18-foot ceiling, dangling down to connect to each desk. At the center of the space stands a line of two dozen 7-foot-tall hardware racks stacked with video and audio decks, processing equipment, and loads of computer horsepower for encoding immense amounts of data simultaneously. But before a file is ready for encoding, it must pass through 1 of 15 high-powered audio/video-capture workstations that sit atop makeshift desks made of doors and filing cabinets.

A compressed signal can be no better than the original, and a bad original – especially one that includes noise – gums up compression algorithms that work by weeding out redundancies (such as the unchanging background behind a talking head). Because its customers show up with everything from Hollywood reels to corporate presentations shot with a camcorder, encoding.com concentrates on optimizing quality before encoding. At one of the workstations,

IMAGES BELOW: REUTERS/HO/ARCHIVE PHOTOS; ABOVE: KATHARINA BOSSE

1988 AT&T installs first transatlantic fiber-optic cable.

1989
Number of Internet hosts exceeds 100,000.

Barry Shein founds World.std.com, which soon becomes the first commercial dialup ISP.

1992
Number of Internet hosts exceeds 1 million.

US Robotics Sportster 14,400 fax modem operates at 14.4 Kbps.

US Congress enacts Audio Home Recording Act.

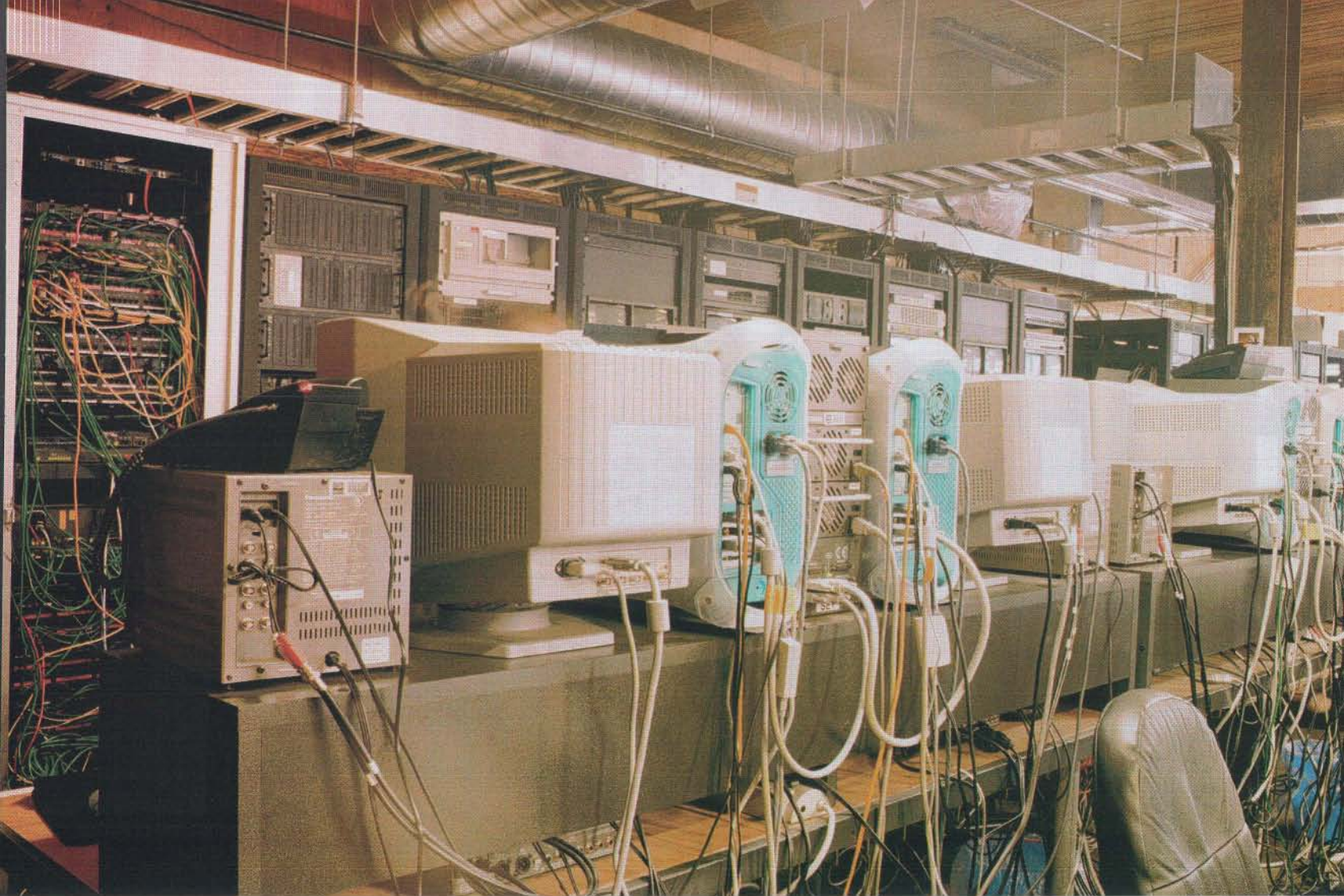
The Moving Picture Experts Group approves MPEG-1 video and audio data-compression spec, including Audio Layer 3, or MP3.

Apple releases QuickTime 1 for Windows.



1993 Intel Pentium CPU runs at 66 MHz.

1994
Under the name Netscape Communications, Marc Andreessen and Jim Clark release Navigator 1.0. ◀



an engineer can scrutinize the original signal for anomalies that might interfere with compression and correct them before putting the squeeze on.

But what really sets encoding.com apart is automation: Once a master audio or video file is optimized for encoding, machines take care of the rest. From the capture workstation, a master and its metadata – including a work order that specifies the desired encoding formats, data rates, and so on – travel via gigabit Ethernet to a “rather big file server,” an SGI Origin 2000 with a disk array that holds a whopping 5 terabytes (or 5 million megabytes). The server commands a massive amount of raw computing horsepower: sixty dual-Pentium 450-MHz machines, each equipped with 256 Mbytes of RAM, and more than 20 G3 400s – and every one is outfitted with customized software that can encode the full range of formats encoding.com supports.

Reading the work order, the server doles out the master to successive dual-Pentium or G3 machines as they become available. As each machine finishes its task, it sends its work back to the server and is ready to crunch another file.

Finally, encoding.com ties a bow on the process with a stroke of *Jetsons*-esque genius: When an encoded file reaches the server, the server can publish it directly to a client’s Web site via FTP without requiring so much as the press of a button by a lowly keyboard jockey. At the same time, the server can deliver metadata about each file directly to the client’s database. For a client like Licensemusic.com, which provides prerecorded music to video producers and the like, the benefits are manifold.

First, no labor is required to keep track of the thousands of files that are created every week. There’s no possibility that files will be misplaced or misnamed, and relationships between different encoded



IMAGES BELOW: COURTESY 3COM; COURTESY MP3.COM; ABOVE: KATHARINA BOSSE

Rob Glaser founds Progressive Networks (renamed RealNetworks in 1997).

US Robotics ships 28.8-Kbps modem. ▶

MPEG finalizes MPEG-2 spec for video and audio data compression.



1995
Progressive Networks releases RealAudio 1.0.

@Home Network is founded to provide broadband Net access via cable modem.

1996 MCI upgrades Net backbone, adding 13,000 ports and

boosting effective speed from 155 Mbps to 622 Mbps.

1997
David Bowie releases five tracks in RealAudio 3.0 format.

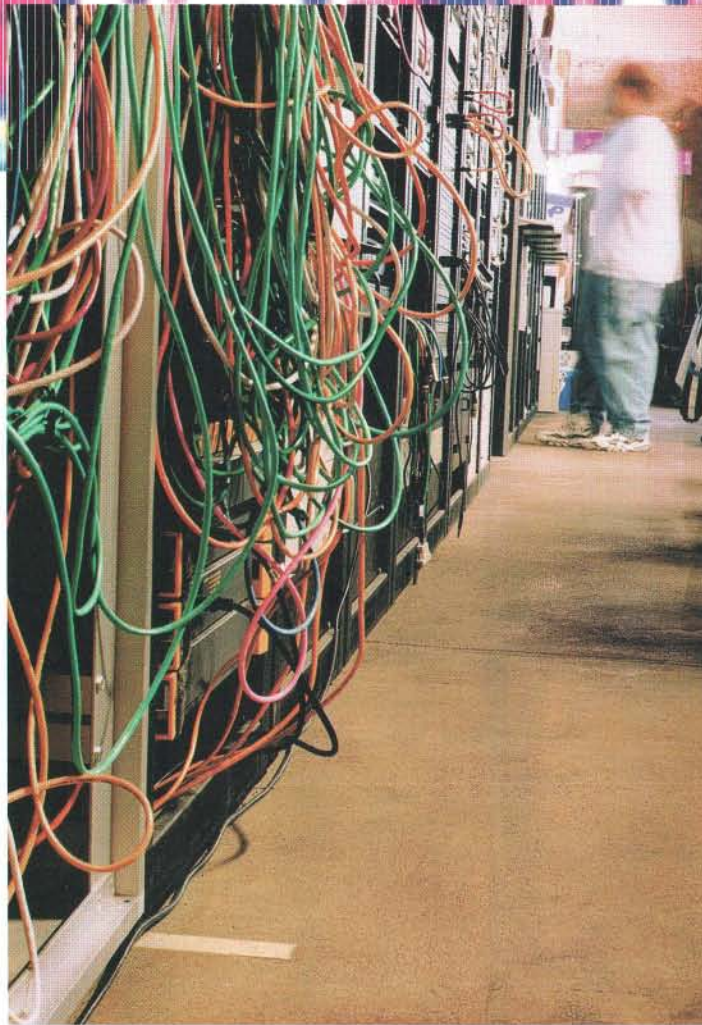
US Robotics ships modems capable of 56-Kbps performance over twisted pair.

RealNetworks ships RealVideo 1.0.

encoding.com founded by Martin Tobias, Alex Tobias, David Conover, and Adam Berman.

MP3.com founded by ▶ Michael Robertson. ▶▶





DECODING THE CODECS

COMPRESSION ALGORITHMS SHRINK HEFTY MEDIA FILES TO NET-FRIENDLY SIZES.

If you think your 56-Kbps modem is fast, guess again. Even if it really could move data at 56,000 bits per second – actually, it's more like 52 Kbps – it would have to be roughly 25 times faster just to play a CD in real time. (CD audio transmits at 1.4 Mbps.)

If you consider video, then 56 Kbps looks even sorer. Production-quality digital video plays at roughly 216 Mbps, nearly 3,900 times faster than 56 Kbps. Even a cable modem at top speed (1.5 Mbps) would need to be 144 times faster to play uncompressed video. Let's look at it another way: To download a minute of CD-quality audio at 56 Kbps takes 25 minutes; to do the same for top-notch video takes 144 minutes. For the average Net user, these download times are unacceptable, which is why we have codecs.

A codec is a formula that removes data – redundant data, data you aren't likely to notice, data that can be derived from other data, and so on – so files can be transmitted more quickly. At the receiving end, a decoder reassembles the data into something coherent. Some codecs are designed to winnow video and audio files so much that they can actually play as they arrive over 28.8-Kbps or even 14.4-Kbps connections, a capability known as streaming. But when you remove that much data, there isn't much left to work with. This is why streaming video often looks like a moving postage stamp.

A codec's effectiveness is measured by three criteria: the processing power needed to decode it, the data rate required to play back encoded data, and how close to the original the final result looks or sounds. For instance, MP3 audio, one of the best-known codecs, can be decoded by an average desktop machine. An MP3 file plays back at roughly 128 Kbps (that is, you can't play it back in real time over a modem; you must download it first, which takes about 4½ minutes per minute of music). And it sounds very close to the original.

Each codec listed at right is supported by encoding.com. And each is tailored to address a specific technical challenge (like real-time audio or video) or business challenge (like how to control redistribution once a file has been downloaded).

▶ versions of the same original file are tracked in a database. Moreover, encoded files are available to Licensemusic.com's customers immediately, which means they can start generating revenue virtually from the moment they're created.

These automated activities are controlled by metadata, the incidental information that travels along with the actual content of a file. The nifty thing about metadata, Sawicki points out, is that it can consist of anything content providers might find helpful. "You can put an encryption key in there," he says, "or other controls or business rules. You can put in something that says, 'Make sure the file plays only 10,000 times, and after that delete it.'"

Now, encoding.com is preparing for the day when all broadcasting will be done over the Internet. "The bet we're making – the bet that everyone on the Internet is making – is that TCP/IP will replace all other networks, and that we're all going to have a lot of bandwidth to play with," Tobias says. "When that happens, the experience we have now is just going to get better and better." ■ ■ ■

1997
Audible Inc.
ships Audible
MobilePlayer.



1998
Microsoft releases Windows
Media Player.

Diamond Multimedia
announces Rio PMP300
portable MP3 audio player.

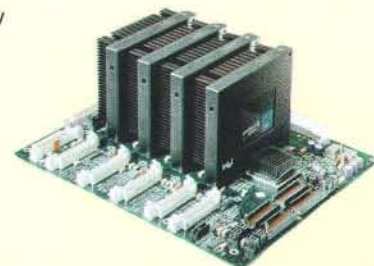
RIAA applies for temporary
restraining order to halt
shipment of Rio PMP300.

US District Court for Central
District of California allows
Diamond Multimedia to ship
Rio PMP300.

MPEG approves preliminary
version of MPEG-4.

RealNetworks releases
RealSystem G2.

Intel Pentium II Xeon
processor runs at
450 MHz. ▶



IMAGES BELOW: COURTESY DIAMOND MULTIMEDIA;
COURTESY INTEL; ABOVE: KATHARINA BOSSE



a2b (AT&T)

Based on the state-of-the-art Advanced Audio Coding (AAC) algorithms engineered by AT&T, Dolby Labs, Lucent, Sony, and the Fraunhofer Institute, a2b boasts higher fidelity than MP3 at faster data rates. But the format's real selling point is encryption that limits playback to one player and restricts the number of plays.

Emblaze (Geo Interactive)

The hook here is streaming Web video without a browser plug-in; the player is a Java applet. The hitch is that Java is inefficient at number crunching, which is the name of the game in codecs. This, coupled with inefficiencies in the codec itself, makes Emblaze more interesting in theory than in practice.

GTS (Graham Technology Solutions)

Like Emblaze, GTS uses a Java-based player to deliver streaming video at dialup data rates.

JPEG (public domain)

JPEG (Joint Photographic Experts Group) is the dominant format for graphics on the Web, with higher color resolution and more sophisticated compression algorithms. A variation, M-JPEG, is popular in video production.

Liquid Audio (Liquid Audio)

The Liquid Audio system is much more than a codec. It addresses a broad range of music-industry needs, from obtaining approvals during production to supplying radio stations to auditioning to selling high-quality audio online. Like a2b, its native codec is AAC, but the architecture can accommodate other codes as well. Liquid Audio also delivers encryption, licensing, and watermarking features.

MP3 (Fraunhofer Institute, Thomson Multimedia)

At the center of the current brouhaha over music on the Net lies MPEG-1 Audio Layer 3, a footnote to the MPEG-1 video spec. Tuned to deliver highest efficiency at 128 Kbps, MP3 is too dense to stream over dialup connections but just light enough to encourage downloading entire songs.

MPEG-1 (Philips and others)

Developed way ahead of its time, MPEG-1 was the next big thing in CD-ROM video. Multiplying CD-ROM speeds boosted MPEG-1's quarter-screen image up to roughly VHS quality, and the advent of Pentium processors enabled playback without expensive add-in hardware. Look for a comeback as producers find that DVD can't hold enough MPEG-2 data. Incidentally, the intellectual-property rights surrounding MPEG-1 are so entangled that nobody can say who owns it.

MPEG-2 (MPEG-LA Consortium)

This is the format for DVD video and for delivering robust and full-

screen broadcast programs to cable head-end stations. It takes a 450-MHz PIII to decode the stuff reliably without extra hardware, but the new wave of set-top boxes and Sony's upcoming PlayStation II are bound to increase MPEG-2's base.

QDesign Music (QDesign)

Distributed with QuickTime 3.0, this is the codec to beat for stereo audio delivered at dialup data rates. But don't expect to be impressed if you're playing it back with a processor running at less than 100 MHz.

QuickTime 2.5 and 3.0 (Apple)

QuickTime isn't a codec. It's a media architecture that encompasses a variety of codecs as well as scrolling titles, real-time video effects, and interactivity. QuickTime 2.5, a CD-ROM-era technology, suffered from a lack of Net savvy and a disparity between Mac and Windows versions. Version 3.0 equalized Mac and Windows and added three quantum-leap codecs: Sorenson Video, QDesign Music, and Qualcomm PureVoice. QuickTime 3.0 also added HTTP streaming (properly called progressive download), which means a file can begin playing smoothly before the whole thing has arrived. True streaming for QuickTime, which begins playback immediately but may lack a smooth listening and visual experience, was released in beta in April 1999, only a few days behind Microsoft's Windows Media Technologies.

RealMedia 5.0 and G2 (RealNetworks)

A leader in true streaming video and audio to dialup connections,

RealMedia is an architecture that embraces the RealVideo and RealAudio codecs, among others. Version 5.0 was the first implementation that really worked. G2 improved the codecs substantially and added interactive features via SMIL (Synchronized Multimedia Integration Language).

Sorenson Video (SorensonVision)

Sorenson Video delivers a vast improvement over its predecessors, including RealMedia G2, at dialup data rates. But its sweet spot is in the cable-modem range, where it can manage dazzling video that doesn't overtax the CPU. As part of QuickTime 4.0, Sorenson will support lower bit rates.

Windows Media Technologies (Microsoft)

Combining Video for Windows, ActiveMovie, and NetShow into a unified architecture, Redmond's newly unveiled Windows Media Technologies deals simultaneous body blows to a2b, Liquid Audio, MP3, QuickTime 3.0, and RealMedia G2. The new codecs are impressive – Microsoft Audio Codec 4.0 for audio (the first three versions of which never left the laboratory) and Microsoft MPEG-4 for video (a premature stab at implementing the Moving Picture Experts Group's next-generation standard, which remains to be approved). Microsoft has built in features for intellectual-property protection and ecommerce. Expectations are running high, but it's all still in beta and currently promises more than it delivers.

– Ted Greenwald

US Congress passes Digital Millennium Copyright Act.

AT&T releases beta of DjVu image-compression technology.

Microsoft releases Windows Media Technologies.

RealNetworks releases RealJukebox. ▼

Universal Music partners with InterTrust to develop technology for selling music online.

RIAA announces Secure Digital Music Initiative.

Intel Pentium III Xeon processor runs at 550 MHz.

RealNetworks acquires Xing Technology, pioneer in MPEG streaming.



Hollywood motion picture premieres on the Net – available for three days only.

1999
Audible begins offering MP3-encoded content.

IBM unveils Madison Project, a digital audio-distribution platform.

**MEMO TO THE MUSIC INDUSTRY:
PENALIZING THE CONSUMER IS THE
WRONG ANSWER. IT'S TIME TO LISTEN
TO THE SOUND OF THE FUTURE.**

BY VITO PERAINO

The Law of Increasing Returns



MP3 lets you snag music off the Web in the time it takes to clink a martini glass. But it's doing more than that: MP3 is colliding head-on with antiquated copyright laws – laws that the record execs are clinging to in an attempt to control a future market where music will exist only in bytes.

The loudest voice in Big Music, the Recording Industry Association of America, has spent the last few years ignoring the fact that old laws and outmoded business models will never stop technology, when the industry should have been fast-tracking online delivery formats that cater to the consumer while offering artists a reasonable guarantee that their work won't get ripped off.

The purpose of copyright law is to protect the physical expression of ideas – music, poetry, films, novels, software, screenplays, video, et cetera. Copyright provides a temporary monopoly during which the holder can restrict the right of others to copy his expression (literally

Vito Peraino (vperaino@hrblaw.com), a technology lawyer at Hancock Rothert & Bunshoft in Los Angeles, wrote "Organization, Man" in Wired 7.04.

the "copy" right) without permission, which typically means without paying for it. But when piracy is as easy as a mouseclick, the 18th-century edifice upon which the legal protection of intellectual property rests threatens to collapse.

Like a billion Xerox machines on steroids, the Net's copy and distribution engines have knocked copyright law on its ear. About 846 million new CDs were sold last year. But at least 17 million MP3 files are downloaded from the Net *each day*. That adds up to almost 3 billion in the first six months of 1999. And with the introduction of several MP3-compatible desktop players, like RealNetworks' RealJukebox, and myriad new portable devices hitting the market, that figure will soar. The protection of copyrights is still there, but one question nags: Is it worth anything? The answer – which turns recording execs pale – is: Probably not.

The World Intellectual Property Organization, established in 1970 and now representing 171 member states, is charged with protecting the international rights of creators and owners of intellectual property. But with the exponential growth of the online music

revolution, WIPO is still playing catch-up.

The Clinton administration tried to help shore up the crumbling battlements of copyright law through the enactment in October 1998 of the Digital Millennium Copyright Act. The act amends the ancien-régime copyright code and sets out legal and criminal penalties for anyone hacking copyright encryption schemes or manufacturing devices designed to do so.

Also in October 1998, the RIAA sought an immediate injunction to stop further production of Diamond Multimedia's newly introduced Rio, a portable solid-state device that could store 60 minutes of MP3 music. Industry advocates alleged that Diamond violated the 1992 Audio Home Recording Act. The RIAA claimed that Diamond ignored a host of provisions by failing to pay royalties on the devices and by not incorporating a mechanism that would prevent serial copying of the Rio's content. The panic (and reality) was that every college kid with a computer would upload tracks of copyrighted music which could be downloaded to Rios throughout their dorm.

In court, Diamond argued that the Audio Home Recording Act deals with recording devices, and thus doesn't apply to the Rio, ▶▶

2000 MPEG approves MPEG-4 spec.

TiVo delivers a Diamond Rio for television programming.

2001 Motion Picture Association of America proposes the Secure Digital Motion Picture Initiative to create a downloadable-video

file format that incorporates copyright protection.

2002 MPEG approves MPEG-7 encompassing multimedia search, filtering, management, and processing.

2003 Handheld wireless Net radios receive streaming audio on demand.

Handheld wireless TVs use cheap LCD screens to deliver streaming video on demand.



2004 Chinese film students crack Paramount's intranet and post entire contents to Beijing University server. For 79 hours, Net users have free access to streaming 800-Kbps MPEG-2 versions of innumerable movie classics. ◀

SITES + SOUNDS

WIRED



BEGIN DOWNLOAD NOW

MUSIC SITES

Crunch Music

www.crunch.co.uk

The up-to-the-minute source for British dance tracks from a crew of sizzling indie labels, including Platipus Records and Silver Planet. The site also weighs in with reviews of the hottest MP3 players.

About \$1.60 per track

eatsleepmusic.com

www.eatsleepmusic.com

This collection of 1,500 – and counting – downloadable and streaming tunes offers something for every ear – not to mention a \$49.95 karaoke package for those who want to sing along.

Free

EMusic.com

www.emusic.com

Some 10,000 MP3 tracks (including about 30 free promotional cuts), with more added regularly, ranging from alternative rock to jazz, world fusion, gospel, and hip hop.

\$0.99 per track; downloadable albums \$8.99

Internet Underground Music Archive

www.iuma.com

The seminal Net music source, IUMA promotes and distributes tunes from over 4,000 unsigned artists, with an emphasis on cutting-edge, indie, and techno sounds.

Most tracks free; some tracks \$0.99 each

Liquid Audio

www.liquidaudio.com

A one-stop shop for downloads, with a catalog of 23 genres and some 5,400 encrypted tracks from major and indie artists. Free downloadable player available.

Free to \$1.99 per track

listen.com

www.listen.com

Spanning more than 500 genres, this massive directory offers sound clips and reviews by the listen.com editors as well as users. The resource includes links to sites with legally downloadable music.

Free

MP3s on UBL

content.ubl.com/cca/rio

This Ultimate Band List site features five new MP3 files a week from pop and alternative artists who authorize free distribution. You can also click through to the listening station to hear new, streaming music before it's released.

Free

MusicMatch

www.musicmatch.com

A bookmark must for indie mavens, boasting some 1,000 MP3 tracks and links to thousands more.

Free tracks; \$4.99-per-month subscription for 25 tracks from independent artists

Riffage.com

www.riffage.com

This Amazon.com of the MP3 universe sells downloadable indie tracks. Visitors can hear sample clips, read reviews, and create customized playlists.

About \$0.40 to \$0.99 per track

Shoutcast

www.shoutcast.com

An MP3 directory of Shoutcast files available to anyone using the popular Winamp player (or a shareware equivalent). With about 500 stations or channels playing at any given time, Shoutcast offers an eclectic range of stations (from reggae to techno), as well as an option to create your own radio program.

Free

Spinner.com

www.spinner.com

The Spinner player lets users tune in to 120-plus channels of streaming music – anything from rock to urban, dance to moodfood. More than 175,000 songs available.

Free

WorldWideBands

www.worldwidebands.com

Alternative, hip hop, jazz, and blues from indie bands and artists around the globe.

Free

MP3 PORTALS

Daily MP3

www.dailymp3.com

mp3 2000

www.mp3-2000.com

MP3.com

www.mp3.com

MP3now

www.mp3now.com

Mp3-Place

www.mp3-place.com

Mp3Spy

www.mp3spy.com

RioPort.com

www.rioport.com

AUDIO SEARCH ENGINES

Audiofind

www.audiofind.com

FileQuest.com

www.filequest.com

Filez

www.filez.com

FindSongs.com

www.findsongs.com

Kermit

www.oth.net

Lycos MP3 Search

mp3.lycos.com

MP3meta

www.mp3meta.com

Mediafind

search.mp3.de

musicseek

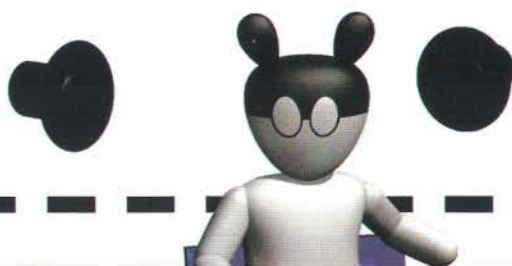
www.audioforge.net

Palavista

www.palavista.com

2Look4

www.2look4.com



MEDIA SITES

Audible.com

www.audible.com

Books, newspapers, journals, and even lectures totaling some 16,000 hours of downloadable audio content. Playable on portable devices, including Audible's own.

\$0.95 to \$9.95 per selection

audiohighway.com

www.audiohighway.com

A diverse library of streaming and downloadable audiobooks and music amounting to more than 5,000 items.

Free

barnesandnoble.com

www.bn.com

More than 700 book titles, as well as *The Wall Street Journal Interactive Edition*, can be downloaded to the Rocket eBook, a 22-ounce handheld that stores up to 10 full-length books.

\$2 to \$24 per title; Rocket eBook: \$399

broadcast.com

www.broadcast.com

The Nile of streaming media has added downloadable options: Music, audiobooks, and now full-length movies are there for the taking (albeit only with a Windows Media Player in hand).

Free

Download.com

www.download.com

CNET's gateway to downloadable tools links you to anything from drivers to Palm apps to general-ogy shareware. MP3 links are abundant.

Free

Launch.com

www.launch.com

"Everything but classical" music, music videos, and video interviews with artists. Downloadable and streaming content available through the Windows Media Player.

Free

Librius.com

www.librius.com

Sells and delivers digital books to PDAs, PCs, and Librius' 8-Mbyte, 12-ounce Millennium E-Reader.

\$3.50 to \$18 per title; Millennium E-Reader: \$199

Sightsound.com

www.sightsound.com

This music-download site passes on higher-than-industry-standard royalties to artists. It also rents and sells videos.

\$1.99 per track; videos \$14.99 and up, rentals \$2.95 and up

SonicNet

www.sonicnet.com

The music network for contemporary tunes, Sonic dials you in to streaming music and video through its visual radio station, FlashRadio, and the music-video site Streamland.

Free

SOFTWARE PLAYERS

a2b Music Player 2.0, by a2b Music

www.a2bmusic.com

Created by AT&T to support its proprietary music format, the player downloads CD-quality music, and includes beefy features such as custom playlists and liner notes. The player costs nothing, unless you count time as money. Typical tracks take 9 to 12 minutes to download on a 28.8 modem. Plays a2b music files.

Free

AudioCatalyst 2.01, by Xing Technology

www.xingtech.com/mp3/audiocatalyst

Converting CDs to MP3s faster than real time, the system rips, encodes, and manages files with a flexible, intuitive interface. Plays MP3 plus CD Audio, MPEG-1 Video, and WAV.

\$29.95

Jukebox 4.0, by MusicMatch

www.musicmatch.com/jukebox

This player lets you manage CD-quality music from the Net, CDs, or even vinyl and cassettes. Advanced options include fade control and a customizable interface. A stripped-down version with lower audio quality is free.

\$29.99

Liquid Player, by Liquid Audio

www.liquidaudio.com

The Liquid Player handles MP3, with support for the Windows Media format coming soon. One-click options let you buy songs or CDs or "Get song free." Downloads, however, are a bit slow.

Free

MacAMP, by @Soft

www.macamp.com

The simple interface packs a punch, with high-quality sound and plug-ins for graphics or sound formats. Look for upgraded features.

Free

RealJukebox, by RealNetworks

www.real.com/realjukebox/index.html

The speediest of players lets you download more than 1,000 songs and record CDs – fast. Plays MP3, plus G2, legacy M2U, RealAudio, and WAV.

\$29.99 with RealPlayer Plus G2

Sonique, by Night 55

www.sonique.com

A playful option, with animated menus and controls. Plays MP3, plus CD Audio, IT, MOD, WAV, and XM.

Free

Virtuosa Gold 3.1, by AudioSoft

www.virtuosa.com

An all-in-one player that downloads and plays, rips from, and burns to CD, and organizes MP3, plus LMP3, MIDI, SMP3, and WAV. Special features include fast-forward and rewind.

\$29.99

Winamp 2.22, by Nullsoft

www.winamp.com

Still one of the most popular players around, coupling an easy-to-use, configurable interface with cool visualization tricks like a frequency-analysis display. Supports MP3, plus CD Audio, MP1, MP2, WAV, Microsoft WMA, and more.

\$10 for consumers; \$25 for businesses

Windows Media Player 6.2, by Microsoft

www.microsoft.com/windows/mediaplayer

Sparse on features, Microsoft's up-and-coming player supports the widest selection of codecs, including MP3, plus ASF, AU, AVI, ID3, MIDI, MOV, MPEG, VOD, WAV, and WMA, and can be upgraded automatically.

Free

which can output only to its headphones. Squeezing through the loophole, Diamond claimed the Rio was a storage device, not a recorder. The court refused to grant an injunction, though litigation continues.

The Audio Home Recording Act goes back, in turn, to the introduction of the digital audiotape recorder. In 1990, shortly after DAT recorders hit the market in the US, the RIAA and the National Music Publishers Association moved to block the sale of the device. DAT recorders made near CD-quality copies of music – and that, said the RIAA, would damage the ability of artists, songwriters, and other industry players to profit from pre-recorded CD, cassette-tape, and vinyl sales.

With the passage of the act, the RIAA won copyright protection by requiring that every DAT deck sold in the US be equipped with technology

Digital watermarking adds information to a file to identify its owner or origin. But what's nice about watermarking is that it doesn't prevent copying files, which means it respects the consumer's right to fair use.

Shaped by more than a dozen court battles dating back to 1841, when *Folsom v. Marsh* weighed the consumer's right to information against the creator's need to profit, the fair-use doctrine simply gives courts some flexibility in how they enforce copyright statutes. Legally, duplicating any original copyrighted work – a few lines from a poem, for example – constitutes a violation. But fair use recognizes that these rights are not absolute.

It's not clear what fair use means in the age of MP3, however, and rules about how we can use digital content are still being hammered out in

hacking: A skilled audiophile could break the encryption and upload the workaround code to the Net.

In April, Microsoft offered up its own copyright-compliant technology, designed to work with its new Windows Media Player. When songs are compressed with MS Audio, they remain locked until a user pays by entering a credit card number, for example, or watching a banner ad. Depending on the client's configuration of the Rights Manager, the file then could be freely copied and distributed, just like any MP3 file, or limited to one playback. This scheme addresses fair use but doesn't guarantee it.

In May, Universal Music Group became the first major record company to announce plans for enabling secure distribution online. Universal is partnering with InterTrust to develop an ecom-

WHO'S TO SAY TODAY'S PIRACY IS NOT TOMORROW'S BUSINESS MODEL?

that recognizes the source material, allowing original files to be copied multiple times but not permitting those second-generation files to be duplicated. The act also imposes a 2 percent royalty on the wholesale price of DAT and Mini-Disc recorders and a 3 percent sum on blank digital tapes and discs. These royalties, says the RIAA, recognized that both the devices and the medium were being sold to copy music, and attempt to offset the loss in sales.

The RIAA, last December, joined with the Recording Industry Association of Japan, the International Federation of the Phonographic Industry, leaders in the tech industry, and the five major record companies to form the Secure Digital Music Initiative. Its members are developing open standards for digital music distribution. The goal is to convince manufacturers to configure new portable music devices and PCs with a technology that lets consumers rip tracks from CDs – but only for personal use – and prevents uploading to or downloading from pirate sites. Right now, SDMI is working on several schemes for stopping music piracy on the Net, one of which is digital watermarking.

the courts. In the meantime, new watermarking technologies could help broaden the definition of fair use.

For online music, it could do something like this: Download a watermarked song file from MP3.com and email it to your sister in Prague or your cousin in LA. No harm done. But now try downloading that same song to your computer, burning it onto 200 CDs, and selling them on your Web site. Once digital detectives turn up a copy of your CD, they can do a quick search of the Net for the corresponding watermark.

But SDMI's proposed watermarks are just one possibility. Music and technology companies are taking their own approaches. Sony's digital music technology, for example, requires an "authorized" device and embedded chips inside a computer to play back encrypted Sony music. And forget about passing some tunes along to a friend – unless they have a Sony-compatible device, songs won't play back. Also, expiration dates are encoded into files, so with Sony's system, even shared songs have a limited life span. While the Sony initiative ignores fair use, it also leaves itself open to

mercy system for selling tunes on the Web. Though it's cagey about the specifics of the technology, Universal's distribution strategy is to package digital music files in a so-called DigiBox that would prevent the recipient from playing the music back without somehow paying for it. Universal's move is an attempt to leap-frog the copyright debate in the courts and use the technology to move directly to the issue of payment – the real right that copyright protects.

But who's to say today's piracy is not tomorrow's legitimate business model? In June, AOL purchased Nullsoft, the maker of Winamp, the premier MP3 software player for Windows, and creator of Shoutcast, a system that lets audio-philes stream MP3 songs from a personal "radio station." Both Winamp and Shoutcast make it pretty easy to violate current copyright laws. However, the move by AOL legitimizes two products that have long been a thorn in the side of Big Music. AOL has done its part by bringing two important digital music apps into the mainstream. Now it's up to the recording industry to shift its strategy – before other technologies do it for them. ■ ■ ■

2008 New codecs deliver HDTV resolution on Net.

Cable modems and DSL phone services achieve 50 percent penetration in US.

2009 ABC debuts a Net-only soap opera, aimed at office workers.

2015 Yahoo! Media buys Turner Networks for an undisclosed sum. ▶



Yahoo! Media announces that all future Turner content will be available exclusively online.

2016 Interactive sitcom *My.Friends* grips nation.

2024 Fiber to home available to 50 percent of US public.

Compiled by Ted Greenwald

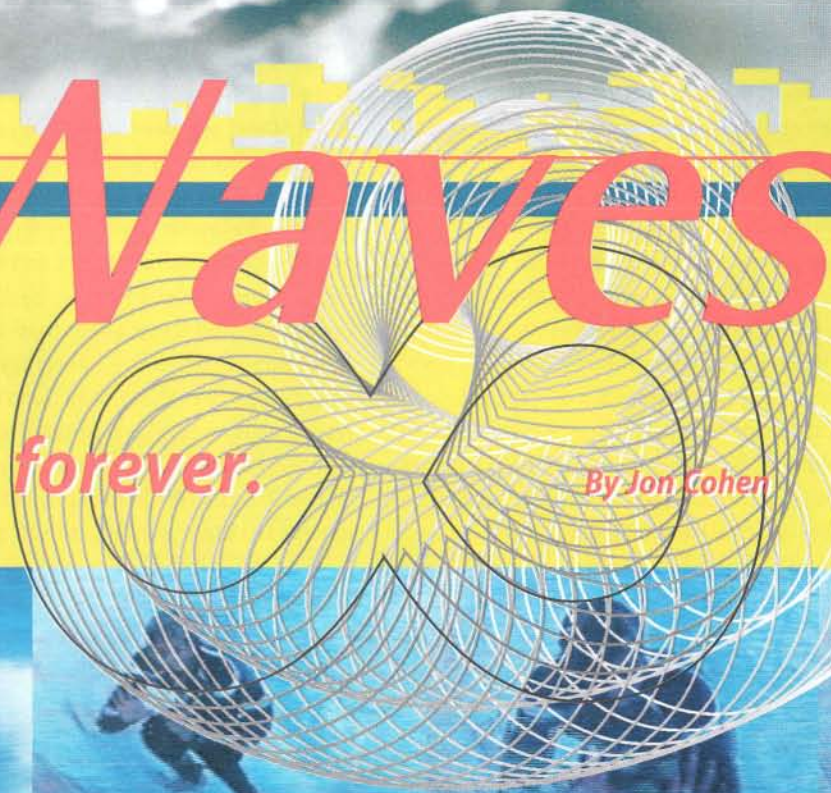


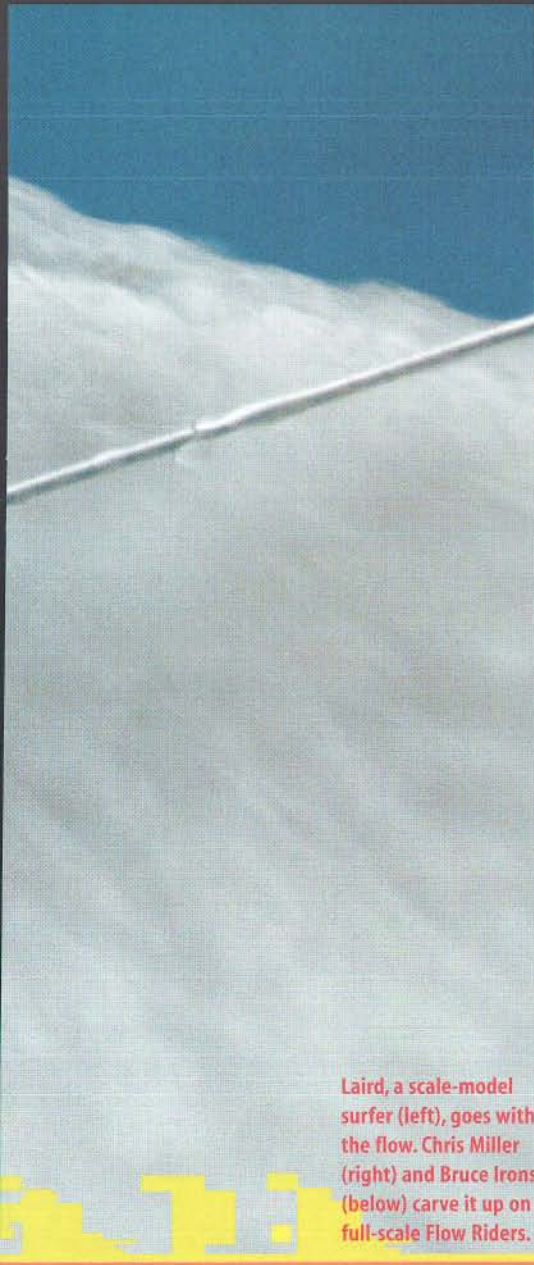


Making Waves

Grab your board.
Surf's up – forever.

By Jon Cohen





Laird, a scale-model surfer (left), goes with the flow. Chris Miller (right) and Bruce Irons (below) carve it up on full-scale Flow Riders.



Tom Lochtefeld, a ball-capped, lanky 47-year-old, stands on a bluff watching the waves pound a small, storied cove in La Jolla, California. He props his bearded chin between a thumb and index finger and slowly taps it, evaluating the surf variables. A powerful northwesterly swell from a storm that churned the Gulf of Alaska five days ago rolls in full force.

Directly beneath the bluff is Simmons Reef, and it can't handle today's thick swell. The lone surfer out there is getting spanked big time. A little farther south, at Windansea, the break that Tom Wolfe celebrated three decades ago in *The Pump House Gang*, the swell is coming in at the wrong angle. Consequently there's nothing to surf – and no one out there. Even farther down the coast, but still in view, lies Big Rock – and Big Rock's been firing all morning. Even though the waves have a beautiful shape, there have been only about half a dozen guys on them at any given time. By my estimate, it's well worth a quick session.

Lochtefeld just taps his chin. He looks at his oversize Swatch watch – one of the new ones that keeps "Internet Time" on a clock from 000 to 999 – and then back out at the ocean. Finally, he decides the tide has dropped too low; the waves are losing their composure, falling short of Lochtefeld's high standards: "We should have gone out earlier."

A good wave is hard to find; a good, empty wave, even harder. This is the existential woe of surfers, but it's also a real problem. There are anywhere from 1 million to 2 million surfers and fewer than 100 great surf spots around the world. On good days (and most days aren't) these spots are jammed, and you have to fight to get a wave to yourself – often facing down the hostile local hotshots who intimidate newcomers. Even once you're riding a wave, you frequently have to slalom through the crowd, and accidents are not uncommon. Between bad vibes and the threat of injury, the soulful aspect of surfing disappears. And this is why Lochtefeld may soon be hailed as some kind of prophet, for he has created one technology, and champions another, that has the potential to generate artificial waves even a surfer could love.

The first innovation is the Flow Rider, a land-based machine Lochtefeld invented in the late 1980s and has been refining ever since. Installed in more than 20 water parks around the globe, the Flow Rider shoots thousands of gallons of water a second up a padded, sharply angled slope while thrill seekers ride the torrent on bodyboards. The Flow Rider has made for a decent business, too. Each new Flow Rider means on average a seven-figure contract to Lochtefeld and his company Wave Loch. They are developing Flow Riders for a Taiwanese shopping mall, a water park in the United Arab Emirates, and a proposed ocean-front amusement park at San Diego's Mission Beach.

Now, with funding from Swatch, Wave Loch has built a \$2 million mobile Flow Rider to popularize a radical new





sport: flowboarding. With flowboarding, you actually stand up on a snowboard-shaped piece of compressed foam and surf the Flow Rider. Lochtefeld has not yet offered flowboarding to the public (for liability reasons, he hires talent to demonstrate it), but he hopes the Swatch Flow Rider, on tour this summer in Europe, will drum up excitement and more sponsorship – outside of Norway. For some reason, the Norwegians were the first to take an interest in the new sport, and they currently host the only annual flowboarding contest. Next summer Lochtefeld plans to offer flowboarding to the public in San Diego, and Swatch intends to showcase it in Sydney at the 2000 Olympic Games.

At the same time, Lochtefeld is pushing for the development of artificial reefs, like the one coastal engineer Dave Skelly wants to build off the coast of Los Angeles, about 500 yards from the beach at El Segundo. Skelly's controversial

Jon Cohen (cohenj@ix.network.com) writes for Science and the new magazine Talk.

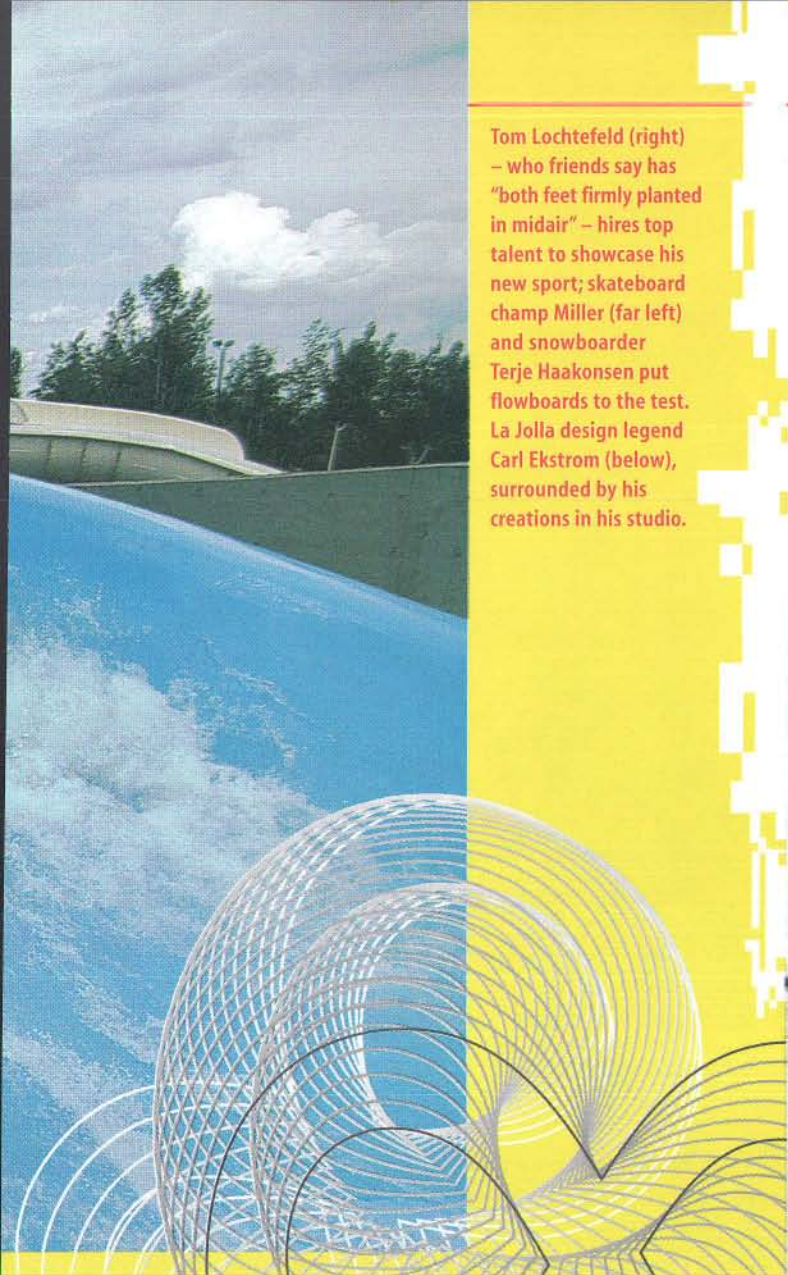
plan calls for sinking massive bags of sand that will sit on the ocean floor and form a V-shaped wall. As ocean swells approach the shore, they will hit the V and form a surfable break. It is an expensive and technically formidable proposition. In fact, if Skelly succeeds – he's set to begin construction in September – his will be the first artificial surfing reef in the United States and only the second in the world, trailing the one designed by Cahri Pattartchi of the University of Western Australia and completed Down Under last spring.

Lochtefeld, for one, thinks Skelly can pull it off. What's more, he envisions creating resorts wherever it's appropriate to build surfing reefs. "It's all doable," he says.

Wave Loch world headquarters is five people in a roomy attic atop Lochtefeld's remodeled home. Through a large dormer window there's a tantalizing view of Simmons Reef, Windansea, and Big Rock. Lochtefeld sits behind a desk on a raised platform, talking

IMAGES CLOCKWISE FROM TOP LEFT: JON FOSTER; SYE WILLIAMS; SYE WILLIAMS

Tom Lochtefeld (right) – who friends say has “both feet firmly planted in midair” – hires top talent to showcase his new sport; skateboard champ Miller (far left) and snowboarder Terje Haakonsen put flowboards to the test. La Jolla design legend Carl Ekstrom (below), surrounded by his creations in his studio.

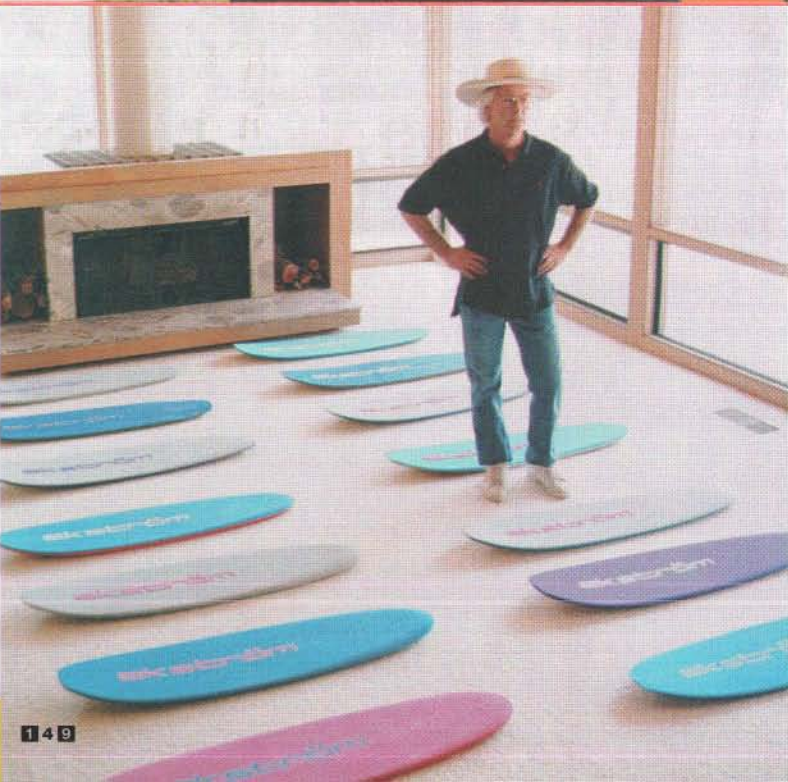


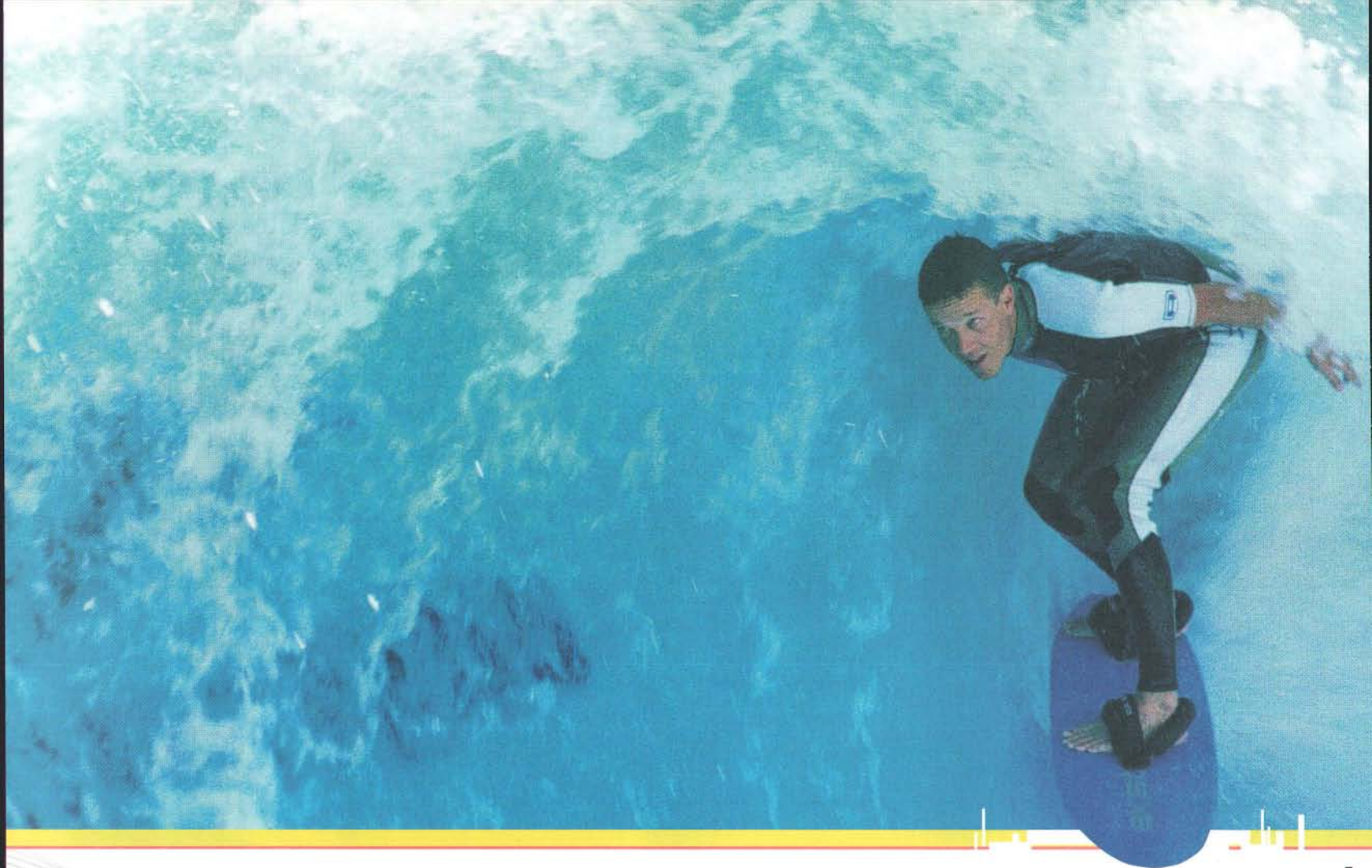
steadily on a telephone headset and looking out over his four assistants. (His desk-on-a-dais, an assistant explains, is positioned in accordance with feng shui.) It's clear he's enjoying his success. In addition to all the Flow Riders, he's consulting on a surfable wave in a pool at the new Mandalay Bay Hotel in Las Vegas, and he's tinkering with a number of seemingly absurd but functional prototypes for surfable waves.

On a VCR in the office, Lochtefeld cues up footage of these works in progress. The first involves reconfiguring the stern of a boat so its wake gives up a surfable wave. “It has promise,” he says, “but it's going to need more R&D.”

Next, he shows off his water sled. When it's towed across a lake or shot down a submerged track, the sled displaces water into a tiny, flawless, tubing wave. It's a great shape, but it's tailor-made for a Lilliputian.

Then there's his latest invention, a device that looks like a wing from a model airplane. When it's pushed through the water, it forms a luscious, drop-dead-gorgeous wave –





except that the waves, too, stand only a few inches tall. "You know that on waves like this, surfers would go nutzoo," Lochtefeld says. "It's just a matter of scaling it up."

Scaling up is precisely what has frustrated many makers of artificial waves. Several theme parks, from the multi-million-dollar Ocean Dome in Japan to Walt Disney World's Typhoon Lagoon in Orlando, have made waves in giant pools by using gates to create surges of water. But this approach – basically a sophisticated, horizontal version of a toilet flush – has failed to impress. The waves simply aren't big enough or long enough, and without critical mass, these pool waves re-create – at best – the conditions of a mediocre day at an average California surf spot.

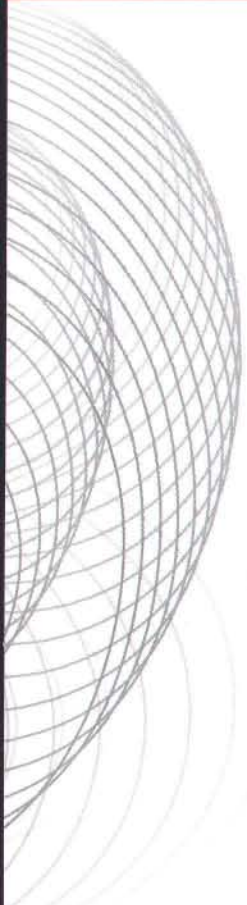
Considering what would-be wave makers are up against, it's no surprise. Beautifully shaped, natural waves are the result of the right-sized swell coming from the right direction and rolling over the right bottom during the right level of tide when the wind is just right. None of these variables is easily reproduced – much less in combination.

At the same time, what constitutes optimal surf is highly subjective, though surfers agree on some of the qualities waves must have to be rated worthwhile. "Organization" is one. Ideally you want the whitewater to scroll across the wave sequentially, evenly, the way a zipper unzips. Surfers also value height and length – the taller and longer the wave, the longer the ride. The speed of the break matters,

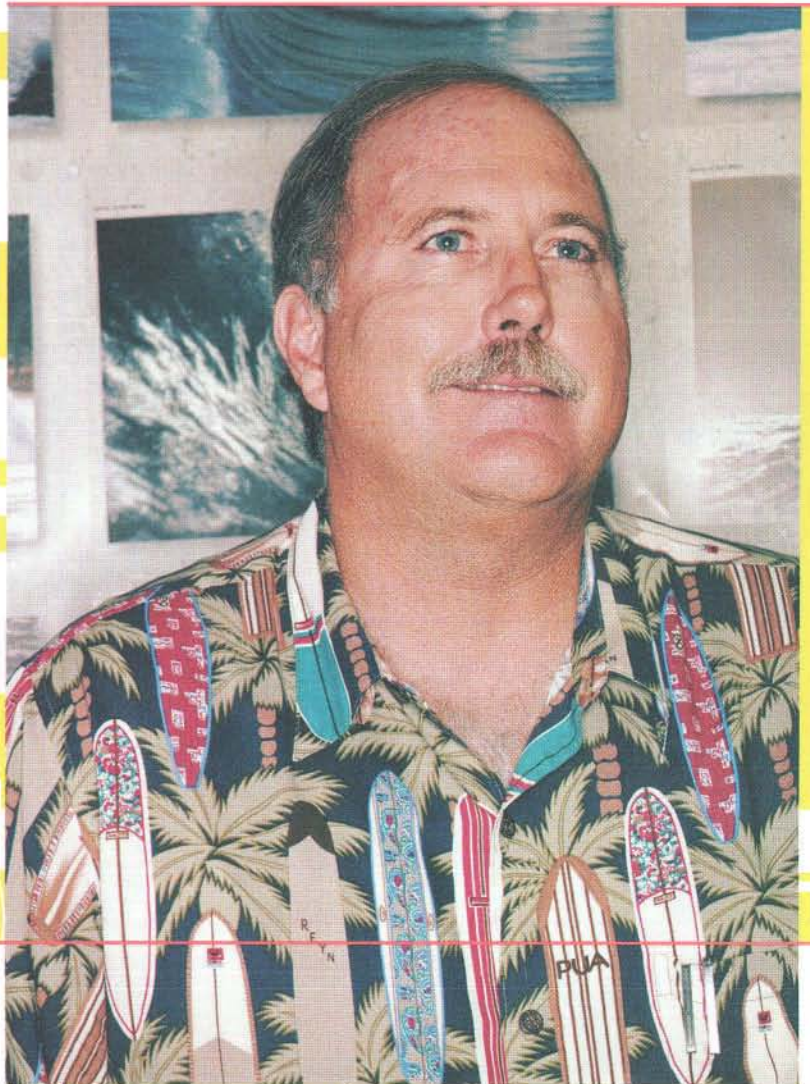
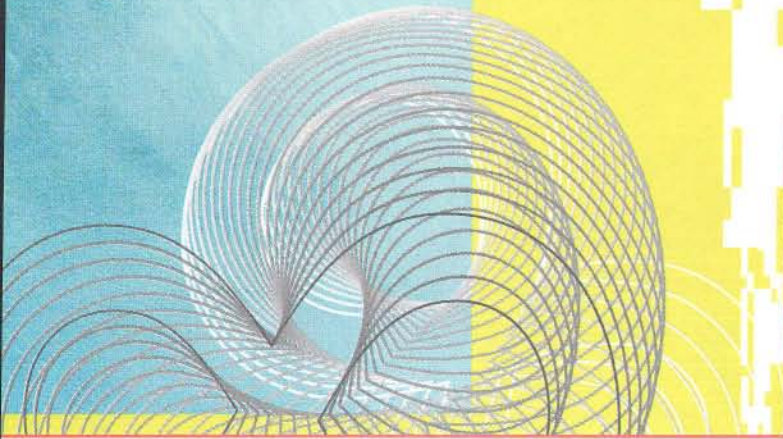
too. Steeper waves have advantages of their own: When the crest of a steep wave breaks, it forms a cylinder, offering surfers the exhilaration of riding under the wave's lip and getting "tubed." Best of all, surfers love it when there's no wind or a light wind is blowing into the waves, which holds up the lip and helps hollow out the wave.

Surprisingly, many theme parks start out with a major handicap: They don't bother to hire surfers to tell them any of this. Consequently, ambitious plans for killer waves result in soft-breaking, slow-moving "mushburgers" that rarely, if ever, tube. One professional surfer aptly compared the experience of surfing Disney's Typhoon Lagoon to riding a bike with a flat tire. Fortunately, the Flow Rider's stationary (long-lasting), fast, and windless wave is changing all this.

The inspiration for the Flow Rider came to Lochtefeld in 1987 while he was watching a particularly hard-breaking La Jolla surf spot, Black's. He noted, as if for the first time, that the water appeared to travel *up* the breaking wave. (Water doesn't actually flow up a wave, but it seems to as the wave surges forward.) Not long after that, a second lightbulb clicked on while he was surfing Big Rock. As with many hollow, steep waves, Big Rock breaks over a shallow reef, yet surfers ride it without scraping bottom. This highlighted another salient but little-discussed fact: Surfing takes place in the top few inches of water. Coupling these



Miller (left) shoots the tube on a Flow Rider in Austin, Texas. Artificial-reef engineer Dave Skelly (right) looks forward to having his designs hit the waves. The world's first artificial surfing reef (bottom) goes in at Cables Station off the coast of Western Australia.

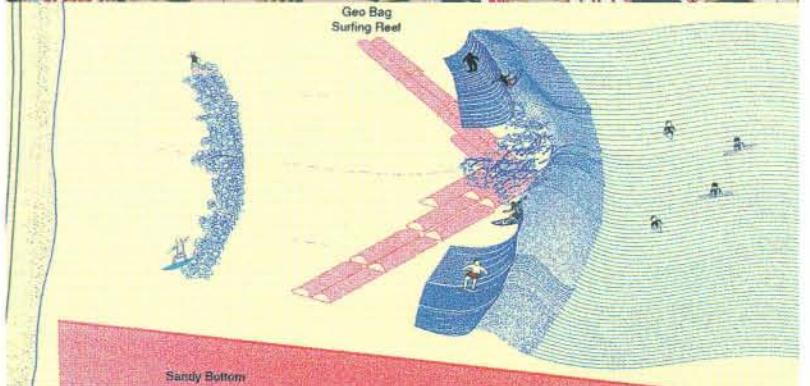


two insights, Lochtefeld began toying with the idea that he could make a surfing wave by shooting a thin sheet of water up a curved surface.

At the time, Lochtefeld had already switched careers, from real estate law to building elaborate water parks called Raging Waters. The parks did well, but, Lochtefeld notes, "There was no surfing attraction in any water park that a surfer would find good. And I knew what the demand would be." He kept toying with his sheet-wave technology, using his bathtub, his swimming pool, and then one of his water parks as labs. Eventually, he enlisted the help of legendary La Jolla designer Carl Ekstrom, and soon the Flow Rider was in beta.

Ekstrom, who looks like a handsome Andy Warhol, is famous for his eccentric designs – and especially for his bizarre surfboards. To develop the Flow Rider, Ekstrom began with miniatures $\frac{1}{24}$ th the size of the final machine, and then engaged in months of trial and error to get the right effect. "There's never been any need for people to learn how water goes uphill," Lochtefeld says. "So there's no study, no body of work, no literature on the phenomenon that we had to deal with."

In 1991, three years after Lochtefeld came to Ekstrom with the sheet-wave concept, the two unveiled the first full-scale Flow Rider at the Schlitterbahn, a water park



PROOF
OF
CONCEPT

AKAMAI OVERCOMES THE INTERNET'S HOT SPOT PROBLEM. BY PAUL SPINRAD



From left: Cofounders Tom Leighton and Danny Lewin with president and COO Paul Sagan.

IMAGE: ANNE MARINE SENSTAD

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Paul Sagan says that Danny could leave the company to finish his PhD and publish his thesis, but then they'd have to kill him. Everyone else at Akamai is encouraged to complete their academic work, a slew of them at MIT, but Danny - him they'd have to off. He knows too much.

Danny Lewin is an algorithms guy, and at Akamai Technologies, algorithms rule. After years of research, he and his adviser, professor Tom Leighton, have designed a few that solve one of the direst problems holding back growth of the Internet. This spring, Tom and Danny's seven-month-old company launched a service built on these secret formulas.

The Akamai solution recalls great historical shifts - discoveries of better, faster ways - like the invention of Arabic numerals, or the development of seafaring. Take the latter: For most of prehistory, people traveled exclusively over land. Then, around 5,000 years ago, they discovered that floating cargo on water was easier than lugging it across terrain - no mountains to climb, no roads to negotiate. Seafaring transformed most of the world's surface from unusable space into a vast ubiquitous shortcut, a portal to faraway lands and great riches. Natural harbors blossomed into sophisticated cities. And although societies continued exchanging goods with their neighbors over land, the first world powers, the first empires, commanded the seas.

In some ways, sending information around the traditional Internet resembles human transport, pre-Phoenicia. The Net was originally designed like a series of roads connecting distinct sources of content. Different servers, physical hardware, specialized in their own individual data domains. As first conceived, an address like *nasa.gov* would always correspond to dedicated servers located at a NASA facility.

C O O L

When you visited *www.ksc.nasa.gov* to see a shuttle launch, you connected to NASA's servers at Kennedy Space Center, just as you traveled to Tivoli for travertine marble instead of picking it up at your local port. When you ran a site, your servers and only your servers delivered its content.

This routing system worked fine for years, but as users move to fatter pipes, like DSL and broadband cable, and as event-driven supersites emerge, the protocols tying information to location cause a bottleneck. Back when *The Starr Report* was posted, Congress' servers couldn't keep up with hungry surfers. When Victoria's Secret ran its Super Bowl ad last February, similar lusts went unsated. The Heaven's Gate site in 1997 quickly followed its cult members into oblivion. And when *The Phantom Menace* trailers hit the Web this spring, a couple of sites distributing them went down.

This is the "hot spot" problem: When too many people visit a site, the excessive load heats it up like an overloaded circuit and causes a meltdown. Just as something on the Net gets interesting, access to it fails.

For more time-critical applications, the stakes are higher. When the stock market lurches and online traders go berserk, brokerage sites can hardly afford to buckle. In retail, slow responses will send impatient customers clicking over to the competition. Users may have Pentium IIIs and ISDN lines, but

works introduced a service perilously similar to what they'd envisioned, but Tom and Danny's load-balancing solution was one step more radical, and the problem was plenty big for two contenders. Paul Sagan, a content guy from Time Warner's Pathfinder, signed up to lead them, and the Cambridge, Massachusetts-based startup began building its own globe-spanning network of servers that would handle Web content in a brand-new way.

It worked. With Akamai's FreeFlow service, all content pours through the entire network, instantly responding to demand, ebbing and flowing as needed, changing routes and locations in response to current conditions. Its ocean of servers connects to the terra firma of the rest of the Net at scores of ports, all of which move data more quickly as conditions continually change.

NO FIXED ADDRESS

In January, Akamai began running beta versions of FreeFlow, serving content for ESPN.com, Paramount Pictures, Apple, and other high-volume clients. (Akamai withholds the names of the others, but you can tell if a site is using the service by viewing the page source and looking for *akamaitech.net* in the URLs. A cursory test reveals "Akamaized" content at Yahoo! and GeoCities.)

THIS IS THE HOT SPOT PHENOMENON: JUST AS SOMETHING ON THE NET GETS INTERESTING, ACCESS TO IT FAILS.

when a site can't keep up with demand, they feel like they're on a slow dialup. And users on relatively remote parts of the network – even tech hubs like Singapore – often suffer slow responses, not just during peak traffic.

ISPs address this problem by adding connections, expanding capacity, and running server farms to host client sites on many machines, but this still leaves content clustered in one place on the network. Publishers can mirror sites at multiple hosting companies, helping to spread out traffic, but this means duplicating everything everywhere, even the files no one wants. A third remedy, caching, temporarily stores copies of popular files on servers closer to the user, but out of the original site's control. Naturally, site publishers don't like this – it delivers stale content, preserves errors, and skews usage stats. In other words, massive landlock.

So in 1998, with their new algorithms in hand, Tom Leighton and Danny Lewin found themselves facing a sort of manifest destiny. The Web's largest sites were straining to meet demand – and frequently failing. Most needed better traffic handling, a way to cool down hot spots and speed content delivery overall. And Tom and Danny had conceived a solution, a grand-scale alternative to the Net's routing system.

In September, a California company called Sandpiper Net-

ESPN.com and Paramount have been good beta testers – ESPN.com because it requires frequent updates and is sensitive to region as well as time, and Paramount because it delivers a lot of pipe-hogging video. On March 11, while ESPN was covering the first day of NCAA hoops' March Madness, Paramount's Entertainment Tonight Online posted the second *Phantom Menace* trailer. FreeFlow handled up to 3,000 hits per second for the two sites – 250 million in total, many of them 25-Mbyte downloads of the trailer. But the system never exceeded even 1 percent of its capacity. In fact, as the download frenzy overwhelmed other sites, Akamai picked up the slack. Before long, Akamai became the exclusive distributor of all *Phantom Menace* QuickTimes, serving both of the official sites, *starwars.com* and *apple.com*.

So how does it work? Companies sign up for Akamai's FreeFlow, agreeing to pay according to the amount of their traffic. Then they run a simple utility to modify tags, and the Akamai network takes over. Throughout the site, the system rewrites the URLs of files, changing the links into variables to break the connection between domain and location. On *www.apple.com*, for example, the link *www.apple.com/home/media/menace_640qt4.mov*, specifying the 640 x 288 *Phantom Menace* QuickTime trailer, might be rewritten as *a941.akamai.com/7/941/51/256097340036aa/www.apple.com/home/media/menace_640qt4.mov*. Under standard protocols, *a941.akamaitech.net* would refer to a particular

Section editor Paul Spinrad (spinrad@wired.com) is the author of *The Re/Search Guide to Bodily Fluids*.

AKAMAI TECHNOLOGIES

VISION

Better living through mathematics: Akamai's egghead algorithms and globe-spanning server network deliver Web site content like a sledgehammer kills a fly. At the literal level, the FreeFlow service promises improved content distribution for online publishers. Between the lines, it's a plan to privatize the Web.

HEADQUARTERS: Cambridge, Massachusetts

FOUNDED: September 1998

EMPLOYEES: 130

KEY INVESTORS: Baker Communications Fund, Battery Ventures, Polaris Venture Partners, TCW Group

INVESTMENT TO DATE: \$43 million

PRODUCT LAUNCH: FreeFlow, April 1999

MAJOR COMPETITOR: Sandpiper Networks, Westlake Village, California

Since its launch in September 1998, this adaptive content distribution service has attracted high-traffic Web sites like Intuit and E! Online. Deals with AOL and Inktomi have helped multiply the size of its network by a factor of 20. Recently, a \$21.5 million second round of financing brought in investment from Hambrecht & Quist, Times Mirror, and BancBoston Robertson Stephens. Akamai's system may be smarter, but its first product release is seven months behind. Place your bets.

TOM LEIGHTON

**CHIEF SCIENTIST
COFOUNDER**

Leighton, a professor of applied mathematics at MIT, literally wrote the book in his field, the graduate-level text *Introduction to Parallel Algorithms and Architectures*. He holds eight patents, has authored more than 100 research papers, and worked as editor in chief of the *Journal of the ACM*. He's also a source of personal inspiration among MIT students and faculty – seen as a noble figure and an exceptionally nice guy.

DANNY LEWIN

**CHIEF TECHNOLOGY OFFICER
COFOUNDER**

After his active service in the Israel Defense Forces, Lewin earned two undergraduate degrees simultaneously at Technion, aka the Israel Institute of Technology, before working for IBM in Haifa and enrolling at MIT. At Akamai, Lewin developed the key algorithms underlying the FreeFlow technology.

GEORGE CONRADES

**CHAIR AND CHIEF EXECUTIVE OFFICER
JOINED AKAMAI: April 1999**

After a 31-year career at IBM, Conrades joined BBN to turn one of the Internet's original research centers into one of its largest service providers. GTE bought BBN in 1997, after which Conrades headed its Internetworking division. Then he skipped over to become a venture partner at Polaris, and through this association became Akamai's CEO.

PAUL SAGAN

**PRESIDENT AND CHIEF OPERATING OFFICER
JOINED AKAMAI: January 1999**

Sagan was president of Time Inc. New Media from 1991 to 1996 and spent a year afterward in Geneva, at the World Economic Forum, before learning about Akamai. At Time Inc. New Media, he launched NY 1 News, the regional cable network that broke ground by sending its reporters out with camcorders. He also helped launch the cable modem service Road Runner and the mega Web site Pathfinder. His penchant for applying new technologies to old media may come from his newsman father, who created a shared story pool "network" for several suburban Chicago papers by using specially equipped typewriters, early Rockwell OCR machines, and a station wagon.

machine. But with Akamai's system, the address can resolve to any one of hundreds of servers, depending on current conditions and where you are on the Net. And it can resolve a different way for someone else – or even for you, a few seconds later. (The /7/941/51/256097340036aa in the URL is a fingerprint string used for authentication.) This new method is more complicated, but like modern navigation, it opens new vistas of capacity and commerce.

Sandpiper remains Akamai's only direct competitor. In April it signed a deal with AOL and Inktomi to begin serving their sites and incorporating their servers into the Sandpiper network. But a month out of the starting gate, Akamai was running immediately neck and neck with its rival, both promising more than 1,000 servers by the end of the year.

ACADEMIC HOT SPOT

Partly because it arrived second, Akamai has had to differentiate its product. The company has done this not only by focusing on fine points of the technology, but also by position-

ing itself as *the intelligent solution*. FreeFlow is the masterwork of leading scientists from MIT.

What's more, the scientists of Akamai are algorithms people. Whereas network hackers tend to be masters of improvisation, spotting local problems and using intuition and quick experimentation to fire off fixes, algorithms people tend to be slower and more rigorous, examining and proving everything along the way. They start with the most pared-down problems – sorting numbers, stacking rectangles, connecting dots – and build up to more complicated situations. They study how efficiently computer programs run under all conditions – the best, average, and worst-possible cases – as the mass of processors, connections, and information become infinitely large. It may take them a while to find a solution they like, but when they do, they know it will work, both on paper and in any reality.

So network growth doesn't scare algorithms people; they always push things to infinity anyway.

You can trace Akamai's genesis to LCS, MIT's Laboratory for Computer Science, where Tim Berners-Lee's World Wide 188 ►



LIFE SUCKS AND THEN YOU FLY

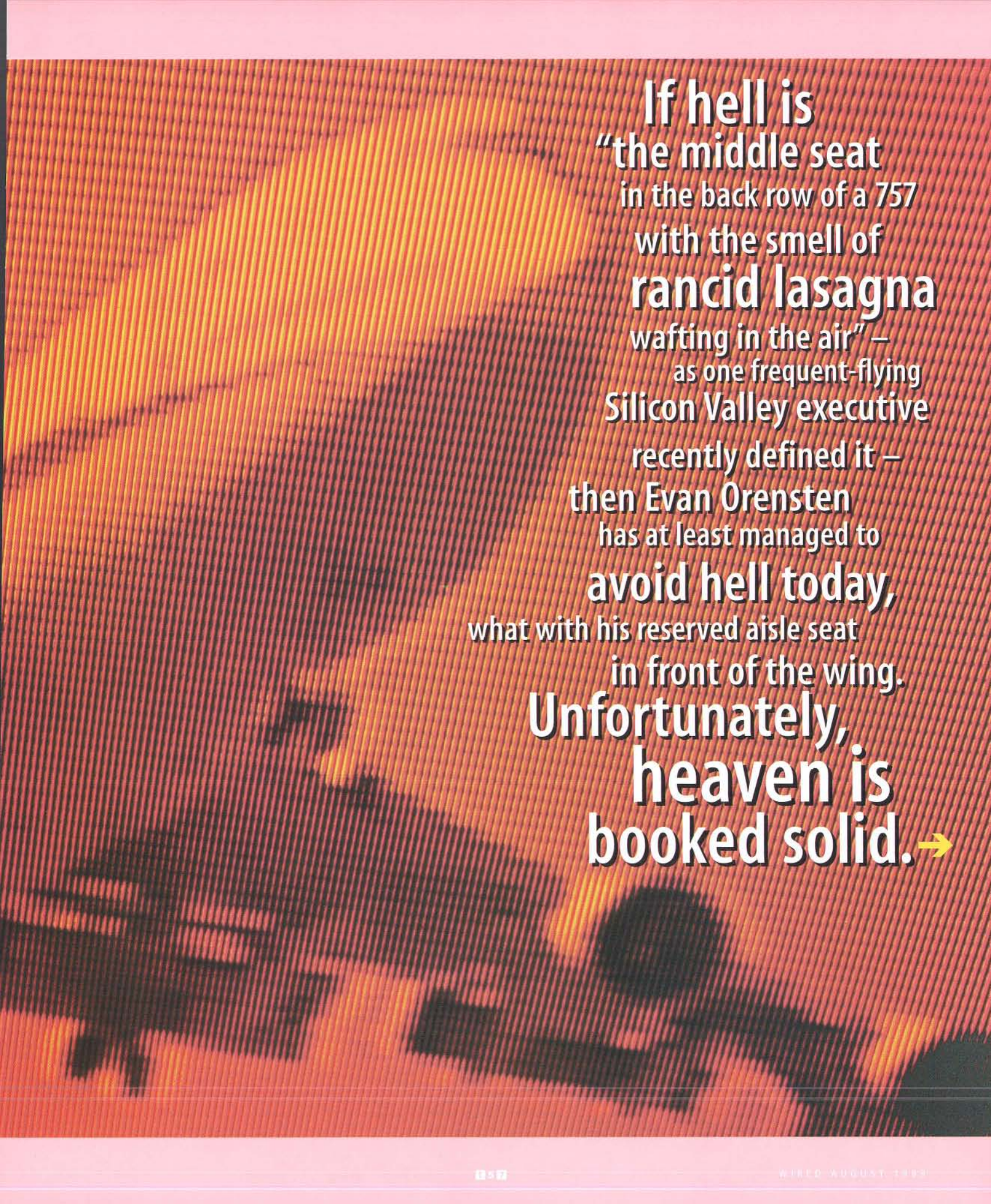
You've got platinum status.

Mega miles.

Upgrades on demand.

**Face it,
you're a new economy slave.**

By Warren Berger



If hell is
“the middle seat
in the back row of a 757
with the smell of
rancid lasagna
wafting in the air” –
as one frequent-flying
Silicon Valley executive
recently defined it –
then **Evan Orensten**
has at least managed to
avoid hell today,
what with his reserved aisle seat
in front of the wing.
Unfortunately,
heaven is
booked solid. →

Survival Tips



"Ask for cheese. It's the only food the airlines can't ruin."
 — Judy Balint, E*Trade

→ Orensten, an executive vice president at Razorfish, the hot Web design and consulting firm, has just learned that his Newark-to-London flight is packed, so there's no chance he can talk his way into a freebie upgrade to first class. Sure, he could simply pay more for a first-class ticket, but that usually isn't done at cash-burning yet conspicuously frugal start-ups like his. The high tech nouveau riche still tend to fly coach because, as Excite cofounder Joe Kraus says, it's an acknowledgment that "we recently came from the garage and could just as easily go back." The bankers may pay for first class; so may the Microsoft guys who haven't yet bought their own Gulfstreams. Everyone else strives to buy with the masses, get upgraded, and recline with the classes.

Today, there will be no miracles for Orensten, even though he's been known to cadge great seats by plying check-in attendants with Razorfish T-shirts, notepads, CDs, and compliments. ("I'm very good at kissing butt with these people," he admits.) The only other way up would be to cash in a few frequent-flier miles, but Orensten, 33, hoards those like a miser as he marches toward magical status in the 100K club — 100,000 miles in the air for the year — which brings with it automatic upgrades and free tickets.

"It's all about the miles, and this isn't worth losing them," he says, smiling and stretching out in United's Red Carpet lounge, resting up for what lies ahead.

Here's what lies ahead: A 7:30 p.m. red-eye, which deposits Orensten in London at 7 a.m. local time, where he checks in to the Lufthansa lounge. He stays only two hours, long enough to stretch his coach-cramped legs, at which point a call reminds him to lurch onto another plane. At 11 a.m. he lifts off to Hamburg, where Razorfish has an office. The gods smile on him — he's upgraded to business class! But the seats aren't much bigger, and the only noticeable difference, he grumbles, is that "you get your mayonnaise sandwich on a plate instead of in a napkin." With the plane aloft somewhere over France, Orensten fires up his laptop and composes some emails detailing a few in-flight gripes.

"Movies on last night's flights: *You've Got Mail* (urgh), *Waking Ned Devine* (seen it at least five times) ... Did not have my low-fat meal, so boycotted and didn't eat. Halfway into my chemically induced sleep I was forced to get up and let someone sit in the empty seat next to me because their video screen didn't work. I asked if they had to see *You've Got Mail* that badly. Decided that I much prefer the 9:30 p.m. flight on Virgin."

After a stay in Hamburg, Orensten flies to Stockholm for a business meeting. Then it's back to London. Then back to Hamburg. Then to Berlin, Frankfurt, New York, and home, which for Orensten is a relative term — that's where he lives only about 25 percent of the time. He has no wife or kids, and his friends are compartmentalized by city:

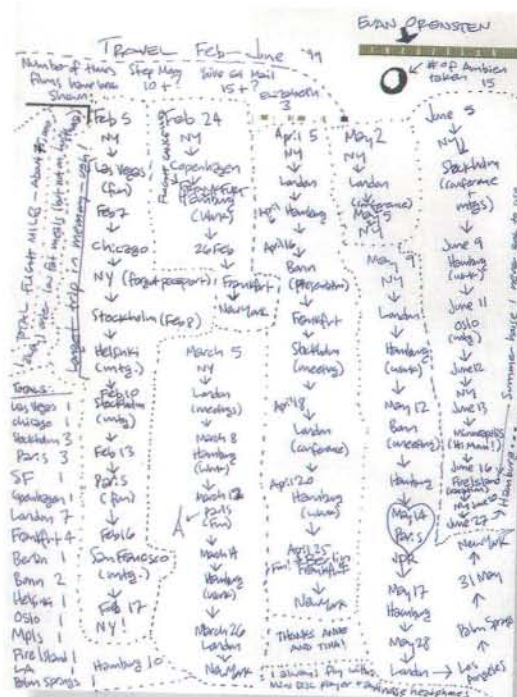
Warren Berger (warberger@aol.com) wrote "Lost in Space" in *Wired* 7.02.

the Paris group, the Hamburg gang, the New York crowd. In an email, I suggest that this is an interesting way to live one's life. To which Orensten replies: "What life?"

Orensten is a "hyperflyer,"

a relatively new species whose members spend more time aloft than aground. They're commonly found swirling in the realms of high tech, finance, media, and consulting — all the brave-new-world industries that are raging with bull-market energy right now. The hyperfliers' destinations may differ, but their distinguishing characteristics are consistently the same. You can spot them in various ways:

They self-identify by the extent of their flying. Net design consultant Clement Mok is a 150K man, for instance, logging 150,000 miles a year as he crisscrosses the country. There are "200 day" people who fly that many days per



year. Hank Nothhaft, chair of Concentric Network, can top all that. He's a 3 million-mile guy — 3 million being his lifetime total of miles logged on American Airlines alone.

They speak in a coded language that has evolved in airport culture. "I'm going from GSO into BOS," reads an email from Nick Shelness, the chief technology officer at Lotus, "then flying out of BOS terminal E on a 20:20 BA to LHR."

They know more than any healthy person should about the legroom and seat pitch on a 757 as compared with, say, a DC-10. "I won't fly a 757 except under extreme duress," says Jeff Drazan, a VC with Sierra Ventures. (He means it, too: To avoid the relatively cramped 757s, he'll switch airlines if necessary.)

They're obsessed with packing efficiently and will go to ingenious measures to travel light — like FedExing clean shirts to their next destination. "Cuts down on baggage,"

SEVEN DAYS ON THE VAPOR TRAIL WITH THE HYPER CLASS

Compiled by Anne Fulenwider

1	CRETIES JENKINS
Petroleum geologist, Arco	
March 1-2 Dallas/Fort Worth to London Gatwick (American, business, 4,787 miles) March 2-3 London Heathrow to Tehran (British Airways, business, 2,737 miles) March 7 Tehran to Amsterdam (KLM Royal Dutch, business, 2,549 miles); Amsterdam to London Gatwick (Transavia, coach, 210 miles); London Gatwick to Dallas/Fort Worth (American, business, 4,787 miles)	
Miles flown March 1-7	15,070
Miles flown per year	100,000

2	MADELEINE ALBRIGHT
US secretary of state	
March 2 Beijing to Chiang Mai, Thailand (US government plane, 1,798 miles) March 3 Chiang Mai to Bangkok (US government plane, 360 miles) March 4 Bangkok to Djakarta (US government plane, 1,427 miles) March 6-7 Djakarta to Washington Andrews Air Force Base (US government plane, 10,205 miles)	
Miles flown March 1-7	13,790
Miles flown per year	247,761

3	BOBBY FINKEN
Sales manager, Eagle-Picher Minerals	
March 1 Dallas/Fort Worth to Houston (Continental, coach, 244 miles); Houston to Newark (Continental, first, 1,412 miles); Newark to Santiago (Continental, coach, 5,099 miles) March 2 Santiago to La Serena, Chile (LanChile, coach, 257 miles) March 3 La Serena to Santiago (LanChile, coach, 257 miles) March 5 Santiago to Newark (Continental, coach, 5,099 miles) March 6 Newark to Dallas/Fort Worth (Continental, first, 1,381 miles)	
Miles flown March 1-7	13,749
Miles flown per year	120,000

4	KATHY EISENHARDT
Professor of business strategy, Stanford University	
March 1 San Francisco to London Heathrow (United, coach, 5,384 miles) March 3 London Heathrow to Washington Dulles (United, coach, 3,692 miles); Washington Dulles to Philadelphia (United, coach, 132 miles) March 6 Philadelphia to San Francisco (United, coach, 2,525 miles)	
Miles flown March 1-7	11,733
Miles flown per year	125,000

5	NICHOLAS NEGROPONTE
Cofounder, MIT Media Lab	
March 3 Boston to Miami (American, first, 1,269 miles) March 4 Miami to London Heathrow (British Airways, first, 4,442 miles) March 5 London Heathrow to Tokyo (British Airways, first, 5,974 miles)	
Miles flown March 1-7	11,685
Miles flown per year	500,000

6	DIANE FRAIMAN
VP of marketing, Informix	
March 2-3 San Francisco to London Heathrow (United, first, 5,384 miles) March 4-5 London Heathrow to Johannesburg (Virgin, business, 5,626 miles)	
Miles flown March 1-7	11,010
Miles flown per year	200,000

7	YO-YO MA
Cellist	
March 5 Boston to San Francisco (American, first, 2,701 miles) March 6-7 San Francisco to Taipei (China, first, 6,478 miles)	
Miles flown March 1-7	9,179
Miles flown per year	200,000

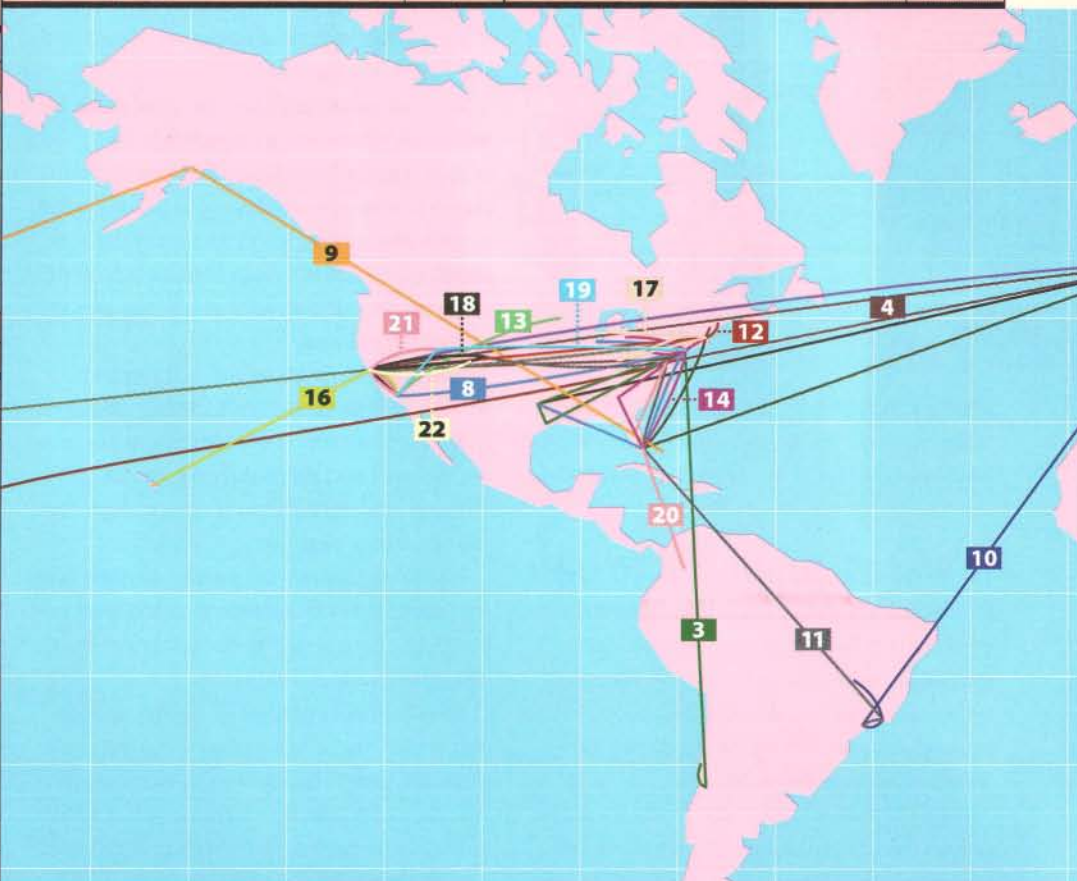
8	MICHAEL HOLCOMB
Flight attendant, American Airlines	
March 1 Los Angeles to New York JFK (American, aisle, 2,487 miles) March 2 New York La Guardia to Chicago (American, aisle, 734 miles); Chicago to New York La Guardia (American, aisle, 734 miles) March 6 New York La Guardia to Miami (American, aisle, 1,104 miles); Miami to Dallas/Fort Worth (American, aisle, 1,128 miles) March 7 Dallas/Fort Worth to Miami (American, aisle, 1,128 miles); Miami to New York La Guardia (American, aisle, 1,104 miles)	
Miles flown March 1-7	8,419
Miles flown per year	600,000

9	MARK MOBIUS
Portfolio manager, Templeton Developing Markets Trust	
March 1 Nassau to Anchorage (private, 4,148 miles)	
March 2 Anchorage to Seoul (private, 3,801 miles)	
Miles flown March 1-7	7,949
Miles flown per year	256,287

10	PAULO COELHO
Author of <i>The Alchemist</i>	
March 1 Rio de Janeiro to Brasília (VASP, business, 566 miles); Brasília to Rio de Janeiro (VASP, business, 566 miles)	
March 2 Rio de Janeiro to São Paulo (VASP, first, 217 miles); São Paulo to Paris (Air France, first, 5,805 miles) March 3 Paris to Zurich (Swissair, first, 293 miles)	
Miles flown March 1-7	7,447
Miles flown per year	100,000

11	JOHN THAM
Manager, Andersen Consulting	
March 1 Rio de Janeiro to São Paulo (Varig, coach, 217 miles) March 2 São Paulo to Rio de Janeiro (Varig, coach, 217 miles) March 4 Rio de Janeiro to Miami; Miami to Washington National (United, business, 5,069 miles) March 5 Washington Dulles to Denver (United, business, 1,460 miles)	
Miles flown March 1-7	6,963
Miles flown per year	180,000

12	BOB METCALFE
VP of technology, IDG	
March 1 Portland, Maine, to Boston (Delta, coach, 91 miles); Boston to San Francisco (United, first, 2,701 miles) March 3 San Francisco to Boston (United, first, 2,701 miles) March 6 Boston to Rockland, Maine (Continental, coach, 160 miles)	
Miles flown March 1-7	5,653
Miles flown per year	150,000



13 VICKIE ABRAHAMSON

Partner, Iconoculture

March 1 Los Angeles to Minneapolis (Northwest, coach, 1,539 miles) March 4 Minneapolis to Ontario, California (Northwest, coach, 1,478 miles) March 7 Ontario to Minneapolis (Northwest, coach, 1,478 miles)

Miles flown March 1-7 4,495

Miles flown per year 150,000

14 ANDY BERLIN

Chair and CEO, Berlin, Cameron & Partners, Advertising (cofounder, Goodby, Berlin & Silverstein)

March 1 Fort Lauderdale to New York La Guardia (Delta, first, 1,066 miles); New York La Guardia to Detroit (Northwest, coach, 515 miles); Detroit to New York La Guardia (Northwest, coach, 515 miles) March 2 New York La Guardia to Boston (Delta Shuttle, 179 miles); Boston to New York La Guardia (Delta Shuttle, coach, 179 miles) March 3 New York La Guardia to Pittsburgh (USAir, 347 miles); Pittsburgh to New York La Guardia (USAir, coach, 347 miles) March 4 New York La Guardia to Atlanta (Delta, first, 767 miles) March 5 Atlanta to Fort Lauderdale (Delta, first, 566 miles)

Miles flown March 1-7 4,481

Miles flown per year 500,000

15 ROBERT WOLK

Executive director, investment-banking division, Goldman Sachs Hong Kong

March 1 Hong Kong to Singapore (Cathay Pacific, business, 1,615 miles) March 4 Singapore to Hong Kong (Cathay Pacific, business, 1,615 miles)

Miles flown March 1-7 3,230

Miles flown per year 450,000

16 DENNIS DEANDRE

CEO, LoopNet

March 1 Lihue, Hawaii, to San Francisco (Hawaiian, coach, 2,387 miles) March 4 San Francisco to Los Angeles (United, coach, 346 miles); Los Angeles to San Francisco (United, coach, 346 miles)

Miles flown March 1-7 3,079

Miles flown per year 80,000

17 TOM PETERS

Business guru

March 1 Albany to Milwaukee (United, first, 716 miles) March 4 Milwaukee to Albany (United, first, 716 miles) March 5 Albany to Boston (United, first, 127 miles); Boston to Cincinnati (United, first, 727 miles) March 6 Cincinnati to Albany (United, first, 610 miles)

Miles flown March 1-7 2,896

Miles flown per year 1,000,000

18 JOE KRAUS

Cofounder, Excite

March 1 San Francisco to Los Angeles (United, coach, 346 miles); Los Angeles to San Francisco (United, coach, 346 miles) March 4 San Francisco to Aspen, Colorado (United, coach, 861 miles) March 6 Aspen to Denver (United, coach, 109 miles) March 10 Denver to San Francisco (United, coach, 969 miles)

Miles flown March 1-7 2,631

Miles flown per year 100,000

19 BARRY DILLER

CEO, USA Networks

March 1 New York to Deer Valley, Utah (private, 1,985 miles) March 4 Deer Valley to Los Angeles (private, 603 miles)

Miles flown March 1-7 2,588

Miles flown per year 130,000

20 GEORGE ALLEYNE

Director, Pan American Health Organization

March 1 Washington Reagan to Orlando (American, coach, 748 miles) March 7 Miami to Bogotá (American, coach, 1,512 miles)

Miles flown March 1-7 2,260

Miles flown per year 100,000

21 DANNY RIMER

Director of Internet research, Hambrecht & Quist

March 1 San Francisco to Salt Lake City (Delta, coach, 611 miles) March 4 Salt Lake City to San Francisco (Delta, coach, 611 miles); San Francisco to Monterey, California (United, coach, 81 miles); Monterey to Los Angeles (United, coach, 268 miles); Los Angeles to San Francisco (United, coach, 346 miles)

Miles flown March 1-7 1,917

Miles flown per year 150,000

22 MARK KVAMME

Chair, USWeb/CKS Group

March 1 Palo Alto, California, to Aspen (private, 854 miles) March 4 Aspen to Palo Alto (private, 854 miles)

Miles flown March 1-7 1,708

Miles flown per year 500,000

23 NICK SHELLNESS

CTO, Lotus

March 1 Edinburgh to Birmingham (British Airways, business, 239 miles); Birmingham to Frankfurt (British Airways, business, 452 miles); Frankfurt to London Heathrow (British Airways, business, 388 miles); London Heathrow to Edinburgh (British Airways, business, 320 miles)

Miles flown March 1-7 1,399

Miles flown per year 100,000

24 EVAN ORENSTEN

Executive VP, Razorfish

March 1 London Heathrow to Hamburg (Lufthansa, business, 436 miles) March 4 Hamburg to Paris (Air France, business, 462 miles) March 7 Paris to Hamburg (Air France, business, 462 miles)

Miles flown March 1-7 1,360

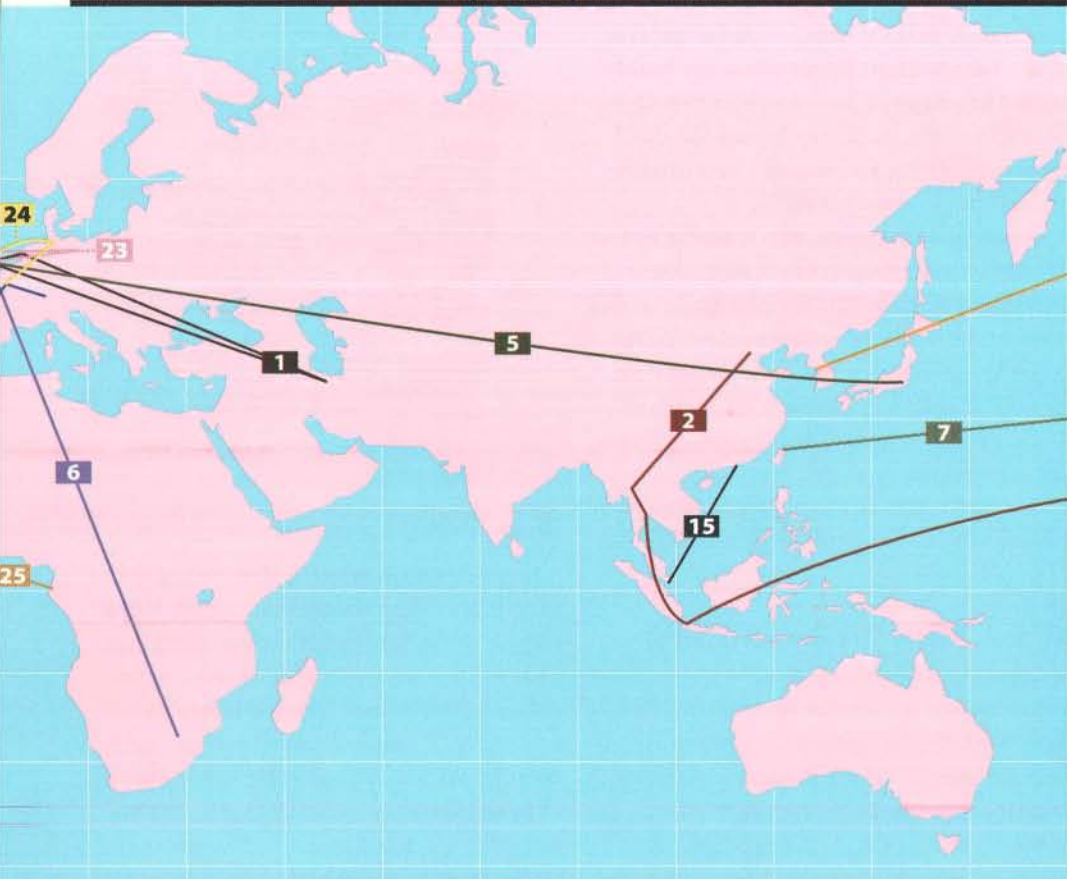
Miles flown per year 150,000

25 MARK MOFFETTEcologist and *National Geographic* photographer

March 1 Libreville, Gabon, to Abidjan, Ivory Coast (Air Gabon, coach, 947 miles)

Miles flown March 1-7 947

Miles flown per year 400,000



→ completing a marketing survey for retailers like Barnes & Noble. Miles can be cashed in for hotel stays, vacation packages, even non-travel-related perks. Last fall, American Airlines pilot-tested a new program with MCI that trades miles for free long distance phone calls.

When hyperfliers like Orensten talk about miles, it's almost as if they're discussing stock options. Last year, Orensten used his miles for a trip to Australia. "The whole thing cost \$30 in tax!" he says in a conspiratorial tone. Nothhaft, of Concentric Network, uses his miles for what he calls "crazy vacations, like taking my family to Hawaii for a football game." Though hyperfliers spend half their lives on planes, it somehow doesn't diminish the appeal of mileage awards, which allow them to spend even more time aloft.

The hyperfliers may think they're getting something for nothing, but they're actually playing the airlines' game. By tightly restricting free flights, airlines have rigged it so that a passenger flying for free almost never displaces a paying customer, and typically costs the airline only about \$20 per flight. But to earn that \$20 flight, hyperfliers will go out of their way to book all their tickets on one airline, and may waste hundreds or thousands of dollars building their status.

"People will do anything to get to the 100K level," says Mark Kvamme, chair of USWeb/CKS. "We had a guy here who, at the very end of the year, took a golf trip to Arizona for no other reason than to push himself over 100K." According to a University of Georgia study, billions of dollars in corporate money are wasted each year chasing frequent-flier miles.

There is more to it than the perks and free trips, though: It's also a style thing. Rob White, president of United's ad agency, Fallon McElligott, says the airlines have figured out that for some people, the real appeal of frequent-flier rewards "is not that you get more free travel, it's that you're accorded status and recognition. You're recognized as a supremely important traveler."

In other words, you use your miles to move up the food chain. Which means you don't have to stand in line or sit in the back of the plane with those other people, the ones Virgin Atlantic founder Richard Branson cheekily calls "riff-raff." It means you eat pork tenderloin with apple confit, get fussed over by attendants, and, most important, don't get your laptop crushed into your body by the seat in front of you.

It's enough to make even an up-from-the-garage centi-millionaire from Silicon Valley desperate for a touch of class.

It's 7 a.m. on a Monday,

and, as usual, they're circling testily around the check-in desk for the Nerd Bird, American Airlines' direct flight from San Jose to Austin. The flight didn't even exist until several years ago, when T. J. Rodgers of Cypress Semiconductor wrote to a marketing director at American Airlines. Rodgers pointed out that Silicon Valley travelers were connecting their asses off every day, trying to get to other

technology hot spots like Austin, Boston, and New York. Give us a direct flight, he told them, and we will fill it.

They didn't believe him at first. But a direct flight from San Jose to Austin filled up right away. Soon they added another in the afternoon. A red-eye was added to another Nerd Bird, from San Jose to Boston, and American upped the number of nonstops from San Jose to New York. "We kept adding flights, and they kept filling up," says Tim Smith, a spokesperson for American Airlines.

The Nerd Bird's passengers are often 80 percent tech people, and the flight is legendary for its sartorial level (low), technical quotient (high), and onboard corporate espionage. A sales director for Seagate Technology once boasted in print about how he reached for his briefcase and saw a rival company's business plan under the seat in front of him. No, he didn't steal it, but he did pick it up and read every word before putting it back. Hyperfliers like Dave Sheffler, VP of sales for Advanced Micro Devices, can be seen glancing over their shoulders as they whisper into the air phone. "You have to be careful," says Sheffler. "You never know who's sitting behind you."



"Get a window seat and build a fortress around yourself. I bring 40 CDs and 20 trade rags."

— Danny Rimer, Hambrecht & Quist

MARK V. MOFFETT'S ACTIVITIES:
December 1995 to December 1998
EXCLUDING 1-DAY STOP-OVERS AND SEVEN VISITS HOME TO CAMBRIDGE

Location	Activities	Tribal Visits
Montana	Search for ice beetles in caves	
Oregon/Washington	Climb snow-covered Douglas firs	
Los Angeles	Meet with designers for documentary movie	
New York	Consult protozoologists, lecture	
Atlanta	Lecture	
South Africa/Kruger	Conference	
Transvaal	Dipterid flies	
Botswana	Fynbos	
Drakensburg	Beetles	Natural Geographic
Cape Town	Beetles	Shrek
Adla	Beetles	
Swaziland	Beetles	
Namibia: Namib Desert	Kalahari Desert	
Namibia: Skeleton Coast	Marine invertebrate research in ecology	
Botswana	Beetles	
Kenya	Facile monkeys	
Egypt: Luxor/Cairo	Photo tut's jewels, royal tombs	
Cameroon	Ant-plant	
England	Garvis's beetle collection, Down (Pleistocene)	
Malta (trvl widely)	Ant-plant	
Washington, D.C.	National Geographic Magazine; lectures	
New York	Book publishers; lectures	
Vancouver/Chicago	Lectures	
Hollywood	Meet producers, writers	
Mexico	Meet artists, film makers	
Iowa/Arkansas	Lectures	
Australia: Brisbane	Lecture	
New Guinea: Bulolo	Antlered flies	Natural Geographic
Crocker Lake	Ant-plant	Natural Geographic
Australia: Lockhart	Lecture; swamp forest project	
Singapore	Ant-plant; Myrmica Geographic Story	
W. Sarawak: Bako	Lecture; documentary research AND Natural Geographic	
Kuching	Lecture	
Peninsular Malaysia	Lecture; pitcher plants	Natural Geographic
Malta (trvl widely)	Lecture; pitcher plants	Natural Geographic
W. Sarawak: Lambir	50 hectare plot-visit study site	
Gunung Mulu	Mass trapping research + Natural Geographic	Oryza
Blah Caves	Ant-plant	Natural Geographic
Sabah: Mt. Kinabalu	Ochid diversity	Natural Geographic
Denau Valley	Mass fruiting research + research	
San Francisco	Arrange to climb redwoods	
Colorado	Visit with parents	
Ithaca	Cornell University lect'r	
Washington D.C.	National Geographic Magazine visit	
French Guiana	CAMPY RAMP research project	
Peru: Lima/Cusco	Ant-plant; Natural Geographic Story	
Mesa Mt. Pk.	Ant-plant	
Hollywood/LA	Meet documentary regarding film documentary	Macaque
San Diego		

Itinerary of photogjournalist Mark Moffett

Paranoia and deceit notwithstanding, the Nerd Bird is a kind of utopia — almost everyone on board, owing to their miles, has attained some level of privileged status. There are no serfs here, only royalty; when the gate attendant announces, "We'll be boarding our gold and platinum members first," it seems as if everyone rises and heads for the jet. The only stragglers I see during my Nerd Bird trip are people jockeying for last-minute upgrades into first class, including, I observe, a bearded fellow wearing a ball cap. The gate attendant calls his name and he calmly strolls

to the plane. In a few minutes, as I head for my coach seat, I will pass him stretched out in the first row, his morning coffee already served to him (in a real porcelain cup!). Others waiting for upgrades are not so fortunate and mill around the check-in desk, hoping and looking bereft.

Why does it matter so much? Most hyperfliers insist they get more work done up front, but it's really about status. The class structure on airplanes is the most rigid in the Western world.

"It's an incredibly emotional issue," says Christopher Meyer, director of Ernst & Young's Center for Business Innovation and coauthor of the book *Blur*. "Flying first class is a kind of territorial battle among animals. Who's gold, who's platinum, who's got the status and the perks."

"It's unbelievable how strongly class lines are drawn on



Madeline Albright, returning to Washington

planes," says Tim Delaney, a renowned ad man. "The curtains separating first class may as well be fucking steel doors."

One might expect that airplane snobbery would have no place in the Silicon Valley culture of egalitarian info-revolutionaries, but one would be very wrong. Meyer notes that a big part of the Silicon Valley mind-set involves "being countercultural in a visible way. Wearing jeans and a bomber jacket in first class makes a statement – that first class is where I belong, even though I don't adhere to the conventions."

Delaney, who flies with the Valley crowd often as he travels to his San Francisco office, sums it up this way: "They wear shorts and all that, but they're as venal as anyone from New York."

But while the techies have begun to lust after first class, it's not cool to pay for it.

Most tech companies still have a "coach only" policy on domestic flights, says Silicon Valley travel agent George Oberle. And even if they could, many would be loathe to fork over the premium because it suggests profligacy – and there is always a chance they may run into their banker on the plane. Financiers always fly first class themselves, but they're not impressed by techies who do likewise. "It does not send a good message about how you are spending the money," says Danny Rimer, a senior analyst at Hambrecht & Quist.

Excite's Kraus says: "There's a stigma to buying first class –

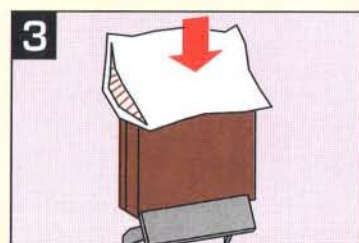
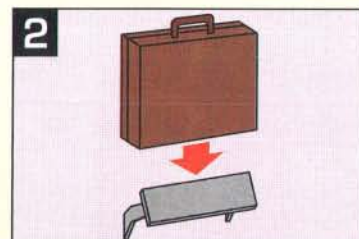
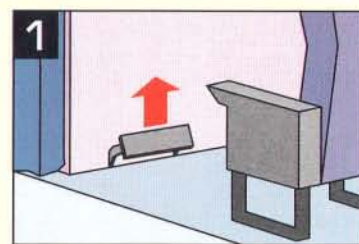
you're supposed to be able to get it without paying for it." Often, it's the midlevel guys who fly the most and get first crack at upgrades. Which means, sometimes, "you end up with a weird situation in which a company's senior managers are sitting in the back, with the junior guys up front," says Rimer. When that happens, if the juniors are smart, "they give up that front row seat without being asked," says Rimer. Likewise, if someone in the service sector ends up sitting in front of a client, it can be awkward. "I've been in first class and seen a client back in coach, and it makes you feel like a decadent sleazebag," says Doblin's Crump. Sometimes, he says, "you have to fly coach for solidarity."

Walking the aisles of the San Jose-Austin Nerd Bird, moving from first class to the cattle car, you'd never suspect you were traversing such a social minefield. On a surface level, the only question that seems to matter is: Can we turn on our laptops yet? As we reach cruising altitude, the soft whirring sound of hard drives revving up can be heard all around. When you take the evening Nerd Bird, the computer screens fill the darkened cabin with an eerie green glow.

Today I'm in the midst of a 16-hour, four-stop circle run around the country: New York to Boston to San Jose to Austin to Dallas to New York. A true hyperflier would not be impressed by this run. (Delaney recently flew 26 hours for a meeting that lasted exactly 30 minutes.) Still, for a groundling, this trip provides a pretty fair taste of the hyperflier life and its routine trials and humiliations. Along the way, I endure stomach-churning turbulence over Boston; a screening of *Stepmom* on the way to San Jose; and sheer, utter chaos in Dallas, where flights, including mine, have been canceled and packs of elderly people wearing Nikes are cruelly herded from one gate to another for flights that never materialize. I do catch one break along the way; on Austin-Dallas, an airline mistake works in my favor as I get bumped to first class, my lack of status notwithstanding. I sip chardonnay and stretch my legs for an hour. But on Dallas-New York, the gods get even: I'm stuck in the last row, next to two lanky guys with shaved heads who repeatedly punch each other in the shoulder. One is reading *American Psycho* and keeps running across parts that make him laugh.

With all the built-in annoyances – the cancellations, the oddballs, the endless bags of Rold Gold Tiny Twists pretzels – it's little wonder that hyperfliers are world-class gripers. They may be hooked on the miles, but that doesn't mean they're happy junkies. Downes describes flying as "the most unpleasant experience outside of visiting a hospital." Finocchio's had it with the new carry-on rules. "It's not like I'm trying to bring a toaster oven on," he fumes. "I'm talking about garment bags!" GreenTree Nutrition CEO Don Kendall complains that "they keep reducing the seat pitch. You can barely open your laptop. The plane really has turned into the Greyhound bus of the skies."

Grumpiest of all is Faith Popcorn, the famous "trend



"Put the bulkhead seat legrest up. Put your briefcase on it, put a pillow over that, and put your feet on top of that. Sleep."
– Nick Shelness, Lotus



TIBOR

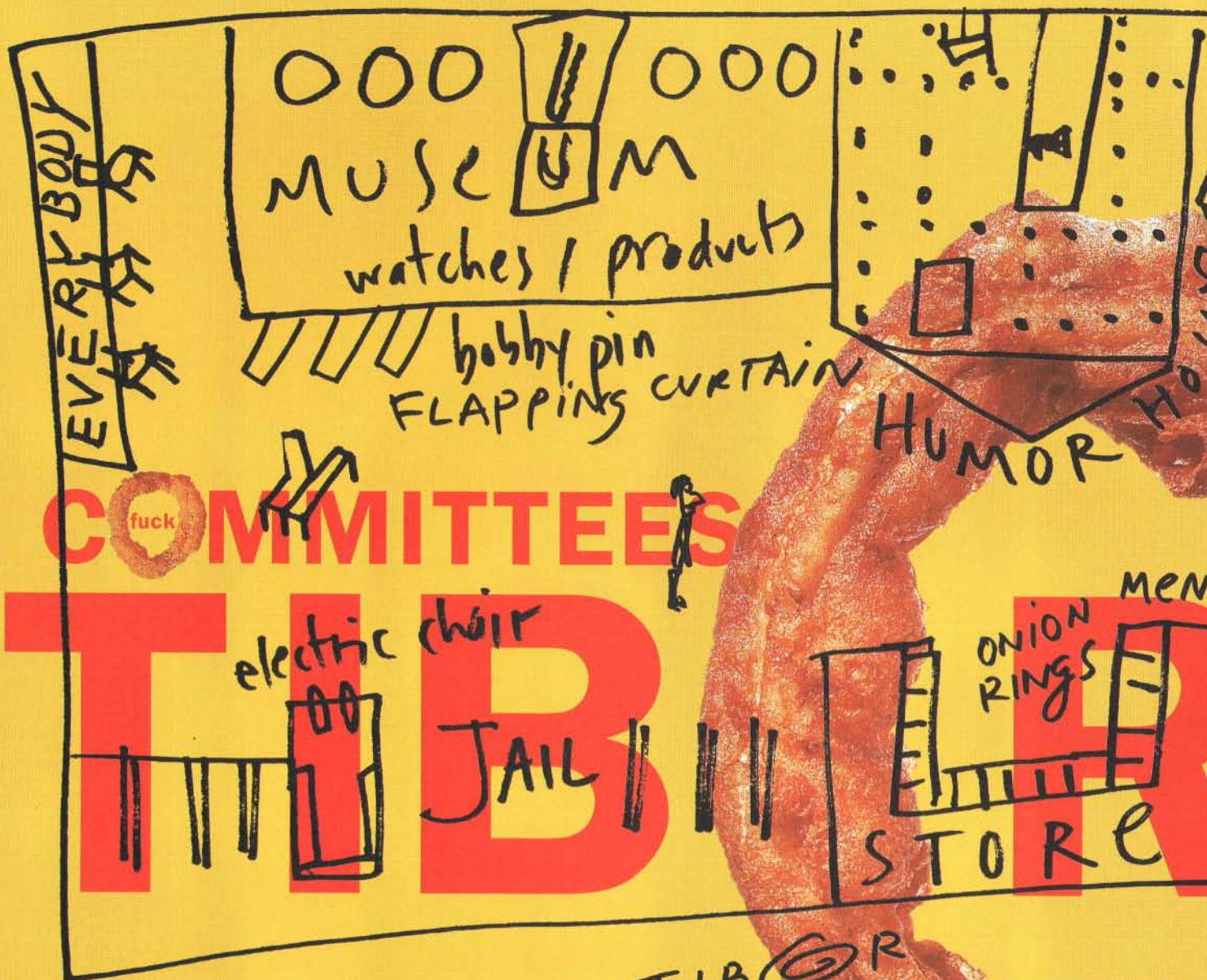
KALMAN, DEVIL.

His work is subversive. He was a fire starter. Tibor Kalman designed his way through the worlds of magazines, advertising, and film, up until his death, at 49, in May. He was a provocateur, a protester, a prankster. *Tiborocity: Design and Undesign* – an exhibit of his troublemaking works at the San Francisco Museum of Modern Art through October 26 – celebrates Tibor’s work and his spirit, capturing both his uncommon sense and his sense of humor. He collected onion rings, eggbeaters, product packaging, and an enormous following of disciples who wanted design to be more than merely style. For Tibor, the best design moved people to action rather than consumption (a fact that irritated many of his clients). He was determined to make everyone look and question, even if he had to be a devil to do it. One Christmas, Tibor’s design firm, M&Co, sent clients a box containing a can of apple juice, a sandwich, and a slice of pound cake – the same meal being handed out on the streets of New York by the Coalition for the Homeless (included was a \$20 bill with the suggestion that it would buy a burger at the 21 Club – or Christmas dinner for 18 homeless people). As the editor of *Colors* magazine, he repeatedly asked us “What if ...?” His depiction of Ronald Reagan with AIDS forced us to ask how policies might have been different ... if. Often Tibor was devilish with a wink. An M&Co watch placed the hours in the wrong order. He was a big believer in turning things upside down, as he did to the A’s in TALKING HEADS on the cover of the *Remain in Light* album. And he turned all of modern design on its head along the way. – *Richard Pandiscio*

This story, created by Richard Pandiscio, longtime friend of Tibor Kalman, combines Tiborisms with sketches of *Tiborocity’s* floor plan by Tibor’s wife, Maira, an artist and children’s book author.



SUCCESS = BOOREDOM.
As soon as you learn,



Good designers (and artists and writers) make trouble



CONSUMER CULTURE IS AN OXYMORON

As soon as you learn,

YOU'LL SEE IT BETTER IF YOU LOOK UPSIDE DOWN

CONSUMPTION IS A TREATABLE DISEASE

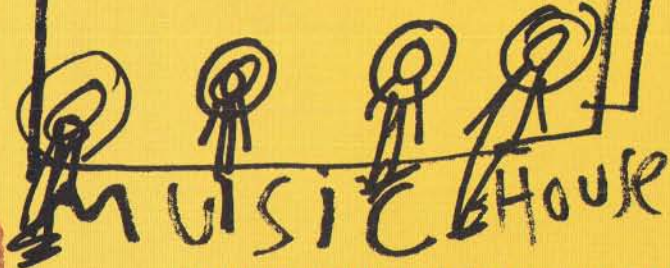


MUSIC TILES

MUSIC VIDEOS

COLORS MAGAZINE

TOWN SQUARE



Religion works better for corporations than

for people

COLORS

DINER



ONION RING COLLECTION



I'M NOT SURE.

TIBOROCITY

ROOM



TA



OBVIOUS IDEA.

How come onion rings?

Because Tibor collected them. Some dreamers see castles, old boots, or the profile of their Aunt Judy in clouds. Tibor saw possibilities in onion rings.



T Bench move

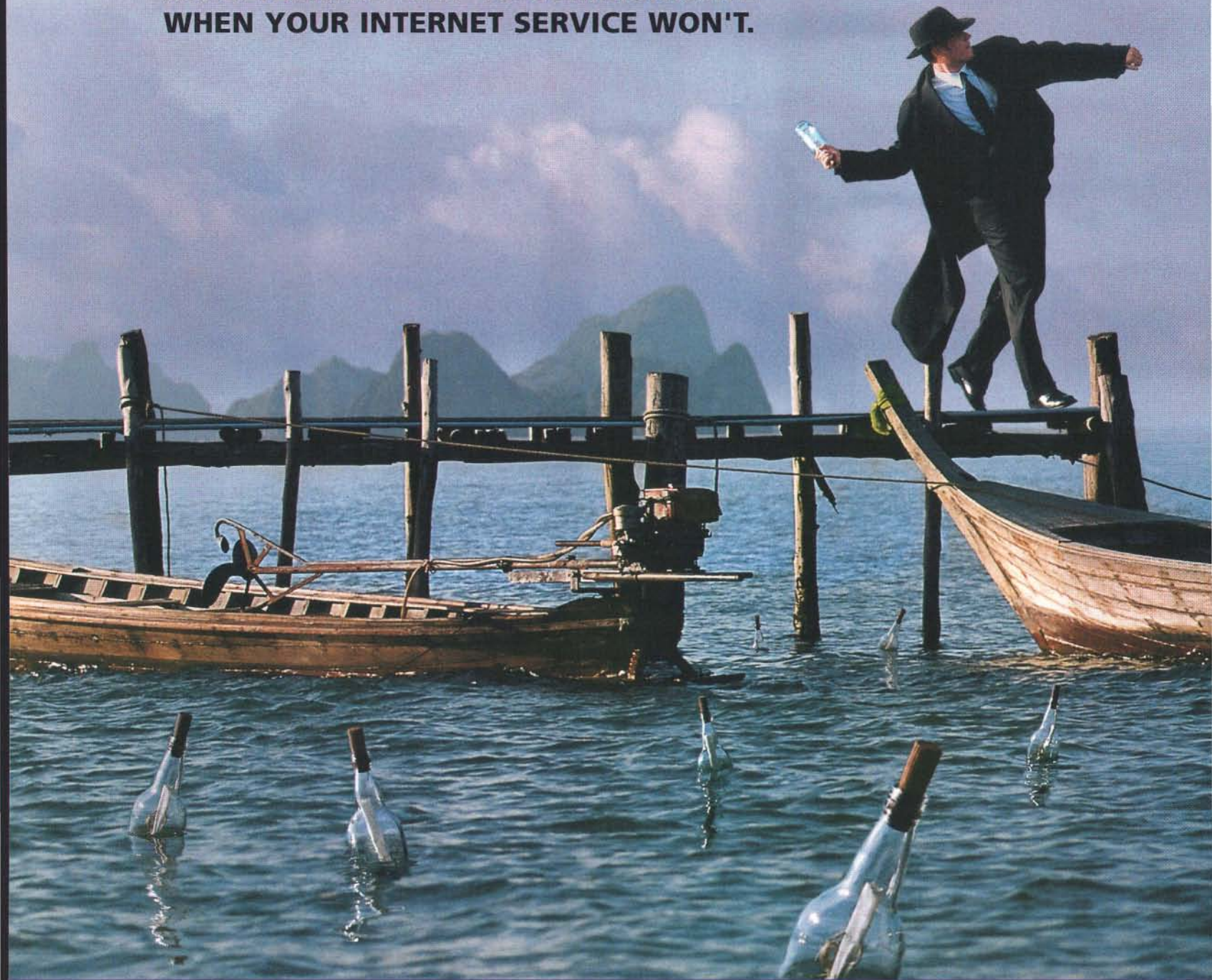
M NOT RE



BUT I'M



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HARDWARE

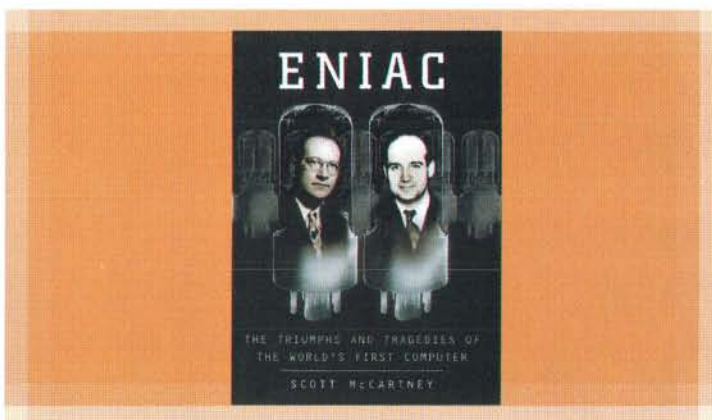
Basement Area Network

Wireless networking lets you link up your home computers quickly, without the hassles of Ethernet or the fickle nature of systems that exploit your phone lines or electrical wiring.

The maestro of cordless networking is Proxim's Symphony. This extremely easy-to-install system is fast (up to 1.6 Mbps, if it's in a good mood) and has a respectable range (up to 150 feet). Each desktop node requires an ISA card with an external antenna (which looks like an anorexic Parcheesi piece), and each laptop uses a PC card with an antenna. Installation is nearly droolproof. After plugging in the cards, you run a simple setup wizard, choose which computer is going to play Internet host, and start beaming bits around your house.

After I tried several home networking products that just didn't sing, Symphony was (I have to say it) music to my ears. — *Gareth Branwyn*

Symphony Cordless Networking Suite: \$149 for ISA card, \$199 for PC card. Proxim: (800) 229 1630, www.proxim.com/symphony.



BOOK

Hacking the Vacuum Tube

"He spoke with a forked tongue. ... He was not to be trusted," J. Presper Eckert once said of world-famous mathematician John von Neumann. Of course, von Neumann's star would shine brightly in the world of early computing — fueled, in part, by the barely acknowledged work of Eckert and his colleague John Mauchly, whose tale is now told in *ENIAC: The Triumphs and Tragedies of the World's First Computer*.

These two men — in the early '40s just bit players in a high-profile technical world — designed and built the first functioning electronic digital computing engine (not quite the stored-program computer we use today). Their story, the ups and downs suggested by the subtitle, and their anger at not receiving proper credit for their ideas are the subjects of this engagingly written book by Scott McCartney, a staff writer for *The Wall Street Journal*.

ENIAC (Electronic Numerical Integrator and Computer), completed in 1946, was hundreds of times faster than its mechanical or electromechanical predecessors. Built under heavy wartime pressure at the University of Pennsylvania's Moore School in order to compute urgently needed ballistics tables for the US Army, it was not finished in time to meet that need, but it was applied to a number of then otherwise intractable problems at the government's Los Alamos weapons lab. (By that time, Eckert and Mauchly had become fully involved with conceiving their next and most famous computer, Univac.) ENIAC was decommissioned in 1955, by then a curious relic of technologies past.

The technically minded will not find much real meat in this book. Its discussions of the underlying technologies are quite simplistic. (Little attention is paid to ENIAC's architecture, and the author doesn't seem to understand the critical difference between diode and triode vacuum tubes.) But the descriptions, such as they are, do provide the lay reader with enough of a sense of the basic technical issues to be able to follow the drama of ENIAC's creation.

It is that drama which is the real story here. Eckert once complained, "I never did anything mean to [von Neumann]; I don't know why he should do something mean to me." The cast of characters (famous and unknown), the contending egos, and the egregious acts of dishonesty and deceit make this book an absorbing read for anyone who savors the human stories that always underlie great events.

— *Robert Spinrad*

ENIAC: The Triumphs and Tragedies of the World's First Computer, by Scott McCartney: \$23. Walker and Company: +1 (212) 727 8300.



WEB SERVICE

Free of Attachments

It's been a pain for years – though just Internet years – to move a huge document from your computer to someone else's. Try emailing that 24-meg movie trailer to a few dozen recipients and see what your network administrator has to say. FTP? Sure, but does your grandma FTP? There's got to be a better way.

A good fix for the file-swap quandary, click2send.com is mysteriously simple: Go to the site, choose a favorite hulkingly mammoth file from your hard drive, and click Deposit a File. Recipients grab their own password-protected copies by going to the site and clicking Pick Up a File. Although the servers delete all documents after 10 days, the service is also oddly free.

There are a few little kinks, but they may be ironed out by the time you read this. When I sent a file from my Mac using Navigator, it showed up with a long, strange name, though it was still usable. But since the service lets you automatically notify recipients by email, it's quick enough to use every day. – *Steve Mollman*

click2send: free. click2send.com; www.click2send.com.



HARDWARE

Polaroid's Sticky Portal

Most reminiscent of *tabloid*, the word *polaroid* suggests blackmail photographs taken in roadside motels, the possibility of domestic pornography (before the advent of the video camera), and police evidence photos of some starkly displayed corpse – appropriate, given that most people caught in the spectral halo of an indoor Polaroid flash tend to look rather mortal themselves. While there is absolutely no technique to a Polaroid – no lens to twist, no light meter to calibrate – there is an art, and only true artists have the confidence to surrender their muse to the machine, which ejects the photograph with all the ceremony of a vending machine dispensing chocolate bars.

So I was especially excited by Polaroid's new line of affordable instant cameras, which provide a low-fi alternative to expensive and tactile-less digital photography. Without motors, they return photography to its most basic level: capturing a moment of light on a piece of film. I was most intrigued by the I-Zone Pocket Camera, a blue, biomorphic bit of plastic about the size of a desk stapler that produces photographs about 1 inch square – the size one imagines a Barbie photograph. The Pocket Camera also produces sticker versions of its photos, so the visual parameters of that genre will no longer be limited to contorted kids aping inside a photo booth at Urban Outfitters.

Two other offerings, the JoyCam and PopShots, are closer to traditional Polaroid cameras in shape, size, and photo quality, although they produce rectangular, rather than roughly square, images. The key difference – besides their being disposable – is that to release a photograph after it is taken, the user must yank on a grenade-like pin on the side of the camera, an admittedly pleasurable exercise.

These cameras have no focusing mechanism and a suggested range of only 3 feet, and I wasn't about to take them on a safari to Kenya. Instead, I stuck to the subject matter most appropriate for Polaroid: people. (I did, however, subject my pug to several indoor flash shots; my girlfriend was compelled to color his eyes black to rid him of that Satan's-minion look.) There is a residual bit of wonder in taking a photograph and instantly showing it to someone, suggestive of the putative belief among primitive peoples that cameras capture the soul. The photos become a kind of social currency, traded for laughs and instant remembrance. – *Tom Vanderbilt*

I-Zone Pocket Camera, JoyCam, and PopShots: \$24.99, \$24.99, and \$19.99. Polaroid: (800) 343 5000, www.polaroid.com/products.



GAME

Burnt Rubber, Chicago Style

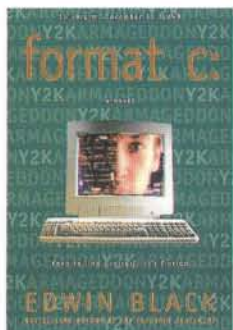
If you've been to the Windy City, *Midtown Madness* will look eerily familiar. With miles of accurately modeled Chicago roads, police who radio one another about lawbreakers (that's you, buddy), and glass storefronts destined to serve as drive-thrus, Angel Studios' new urban-racing game for Microsoft Windows puts the fun back in road rage.

Midtown Madness heads for fast-paced fun instead of blood-and-whiplash realism. It's more of an homage to bumper cars than to Nascar-style racing or pedestrian splatter. Earning the checkered flag demands speed and expert driving, but winning isn't everything. Make sure you take time to stop and smash the flowers – or was that a row of parking meters sprouting from the street?

If having collisions without consequences is one of the game's principal pleasures, it's also a minor failing. Most of virtual Chicago is indestructible. Of course, turning buildings to rubble wouldn't amplify the racing experience, but with so much attention paid to the accurate modeling of vehicle physics, it would be nice to see similar consideration for other laws of nature.

Players have 10 vehicles to choose from. The Ford Mustang is fast, but I usually take the VW Beetle, which handles better in tight alleys and seldom attracts police attention. Dozens of single-player and multi-player races are available; in the Dearborn Dash, you have to get through downtown traffic and over the drawbridge before time runs out. Sounds easy enough. Gripping my joystick, I peel out and slam into an oncoming truck. I try again, making great time until the lights on Dearborn change and my little yellow Bug ends up with the scrunched face of a bulldog. On my third attempt, I hit the rising bridge with seconds to spare, but fail to make the jump. Splash! I'm grinning like an idiot. – *Tom Claburn*

Midtown Madness: \$44.95. Microsoft: www.microsoft.com/games/midtown.



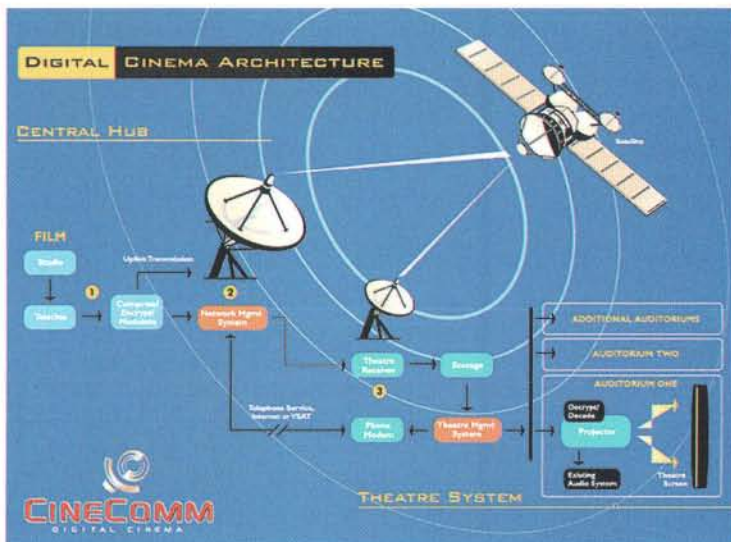
BOOK

Booting Up Beelzebub

Although *format.c:* is billed as a millennium thriller, it's more – and less – than that. On one level it plays on the fear that once a Bill Gates-like evildoer loads his operating system onto every computing device in the world, he'll rule the planet. On another level there's a whole Satan-enslaving-humanity motif. Author Edwin Black doesn't pull off either of these conceits, but he does manage to weave them into an interesting novel.

Unfortunately for readers, the book's weakest point is at its start, where Black struggles, with limited success, to explain acronyms like API and NDA. Characters seem to live in a cardboard reality, and his forays into Judaica and the Holocaust are unconvincing. But the battle of good versus evil is what's intriguing here, and, with the main characters' unnatural predilection for driving around in a Honda Del Sol and punching numbers into a super evil PDA, the story comes through. – Craig Engler

format.c., by Edwin Black: \$24.95. Brookline Books: (800) 462 6420, www.featuregroup.com/format.c.



FILM TECHNOLOGY

Out of the Celluloid Closet

It took an hour to drive from LA to the dusty Tustin Industrial Park, a primary proving ground for CineComm Digital Cinema, the outfit that would conceivably have the cineplex swapping celluloid for bits. I was there for a test drive of the system now showing *The Phantom Menace* at digitally equipped theaters in New York and Los Angeles.

I entered a bright white building that had more air-conditioning than character, and before my eyes could adjust, I was led into a pitch-black screening room, where I was debriefed on how the system works. A finished film is digitized, compressed, encrypted, and shot up to a geosynchronous-orbit satellite, where it resides in 55-Gbyte glory. Theaters pull down the film and stream it to Hughes-JVC digital projectors. Details? Proprietary.

Then they showed me the goods. First, a compilation of pulse-raising scenes from various films like *Star Wars* and *Raiders of the Lost Ark*. The projection is so sharp that the flaws of the original prints – some of them more than 20 years old – pop out in perfect detail. Then comes a *Koyaanisqatsi*-esque montage of sand dunes and close-ups of lizards with such incredible texture that even as I stood inches from the screen the resolution held up. The show ended with a *Tomorrow Never Dies* sequence: a lot of stuff blowing up in crisp, vivid hues. The clarity of the image surprised me, given that the digital projector uses the same three-lens RGB process as a standard CRT video projector, but without the trademark scan lines and bleeding colors.

Digital projection is beautiful – like Imax without the motion sickness – but a few elements are lacking. I missed the magic beam of white light above my head, the comforting hum of film sprockets threading through the projector, even the fact that we'll never again get to yell "Focus!" at a projectionist who, most likely, isn't there anyway. *Cinema Paradiso* this is not, purists will say, but when digital filmmaking catches up, nostalgia will be replaced by a deeper realism.

– Wendy Jackson

Star Wars Episode I: The Phantom Menace, at digitally equipped theaters, including the Pacific Theater, Chatsworth, California. CineComm: +1 (310) 248 6163, www.cinedc.com.

README

ON THE BOOKSHELVES OF THE DIGERATI



DJ SPOOKY THAT SUBLIMINAL KID

aka Paul Miller, musician, writer, conceptual artist.

Brown Girl in the Ring, by Nalo Hopkinson. "Hopkinson is probably one of the premier Caribbean artists working out there. She deals with human beings slowly being subsumed by their architectural environments. And she's amazing at weaving in mythology to current technology. This story is set in future Toronto, where urban decay has kicked in hardcore and there's an illicit trade in human body organs that the government has sort of subsidized. The book started as an essay that Hopkinson thought would just be OK, but she got her essay published as a full-length book. I thought that was beautiful to see."



PATRICIA POMERLEAU

President and CEO, CEOExpress.com.

The Lexus and the Olive Tree, by Thomas L. Friedman. "The metaphor of the Lexus and the olive tree is the tension between the new world of globalized systems and the old world of customs and community. How do you move forward and build a worldwide operating system that respects people's homes and still empowers individuals, countries, and organizations? The book doesn't give all the answers, but it brings up the issues. And it has a Web site (thelexusandtheolivetree.com). A lot of times, when you read a book you may agree with some of the points or argue with it, and now you can go onto a Web site and take your argument to a different level."

– Julie Sullivan



MUSIC

CIBO MATTO

Stereo*Type A (Warner Bros.) If you're a Cibo fan, you'll likely feel you've heard this all before – on their other discs. But they've heightened their textured production on tracks such as "Working for Vacation." And even if the element of surprise is gone, who cares? Cibo's hyperactive grab bag of hip hop/jazz with bossanova sounds veers from kooky raps to near-haiku dreaminess.

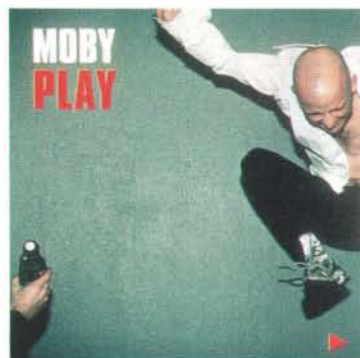
– Beth Johnson



MOBY

Play (V2)

I'm a sucker for a lush soundtrack: strings, driving breakbeats, and all the other goods that electronic music has to offer. But add in samples from some old Deep South spiritual-style recordings and I turn inside out. Moby recognizes the power of such devices: "Honey" builds on a sample taken from a 1930s recording by folk historian Alan Lomax and comes alive within this futuristic medium. The best part is that *Play* sounds timeless, like you should have been listening to this music for years. Never mind the sounds born from so much silicon, I'm talking acoustic pianos and guitars. That, and Moby's desperately beautiful melodies. – Paul Clark

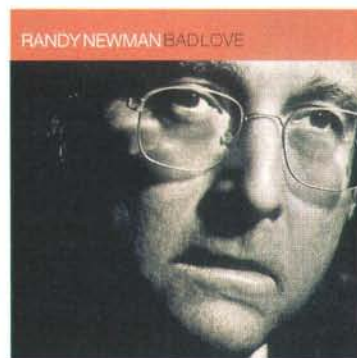


RANDY NEWMAN

Bad Love (DreamWorks)

Just about every one of these 12 songs is a winner, which makes *Bad Love* the best Randy Newman album in more than two decades. That's an occasion for noisy public celebration. This disc is a triumphant return to the sardonic splendors of *Sail Away* and *Good Old Boys*, except it's emotionally more complex and musically richer (Newman's orchestra arrangements are lovely, a dividend of all that movie scoring he's been doing). Tin Pan Alley's greatest – perhaps only – descendant, Randy Newman shows he's still going strong as a writer of brilliant, moving, troubling, funny songs.

– Tony Scherman



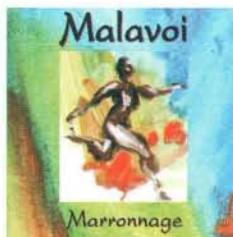
MINISTRY

Dark Side of the Spoon

(Warner Bros.)

Al Jourgensen and Paul Barker open their latest with "Supermanic Soul" – vintage Ministryland. There's no mistaking the band's heavily distorted guitars, processed vocals, and sporadic samples. "Whip or the Chain" features Jourgensen's (mostly unprocessed) voice, which is a rare treat. Unsurprisingly, this album is not for the faint of heart. It's loud, distorted, and worth every minute. For my money, this is better than the more subdued *Filth Pig*. File under "anti-Celine Dion."

– kenn lowy



MALAVOI

Marronnage (Tinder)

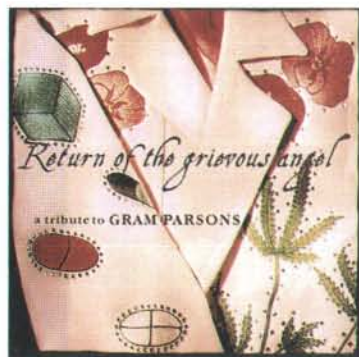
Malavoi, one of Guadeloupe's top dance bands, has become wildly successful by playing a gently swinging music based on the older, more genteel styles of the mazurka and the beguine; they are not unlike the current crop of American swing bands that are also updating arcane music for a modern audience. Malavoi's acoustic sound combines dazzling musicianship with their island's African-influenced drumming tradition. – j. poet



CAPTAIN BEEFHEART & HIS MAGIC BAND

Grow Fins: Rarities (1965-1982) (Revenant)

Don Van Vliet, aka Captain Beefheart, has used his unique grasp of blues, boogie, avant-garde jazz, and arcane field hollers to inform his identity both onstage and in the studio. This five-disc collection of live performances, unreleased demos, and other obscurities highlights a career littered with numerous still-misunderstood classics. Complete with harmonica hoedowns, distended guitar solos, and blues mutterings, the Beefheart universe is a strange and beautiful place. With enhanced-CD footage of Beefheart and his band in concert, *Grow Fins* captures the spirit and alchemy of an essential American artist. – Mitch Myers



VARIOUS ARTISTS

Return of the Grievous Angel: A Tribute to Gram Parsons (Almo Sounds)

It's been 25 years since Gram Parsons died of a heroin overdose at age 26, but his legacy has only grown. On this benefit album, co-executive producer Emmylou Harris gathers artists indebted to Parsons, such as Wilco and Whiskeytown, along with less obvious fans like the Pretenders and Elvis Costello. *Return's* many standouts – including Beck and Harris on "Sin City" and Lucinda Williams and David Crosby on the title track – prove the durability of Parsons' songs. It's a rare tribute that encourages a visit with the originals while standing alone as a great listen. – Beth Johnson



DIANA KRALL

When I Look in Your Eyes

(Verve)

Diana Krall is exceedingly popular, in spite of her nearly glib, laissez-faire delivery. If cool is contagious, this vocalist is the bubonic plague, but her talents are enormous. With her Nat King Cole-inspired trio of piano, guitar, and bass, she's complemented here by subtle, full orchestrations. From the sultry "I've Got You Under My Skin" to the swinging "Let's Fall in Love," Krall shows her latest to be her greatest. – James Rozzi



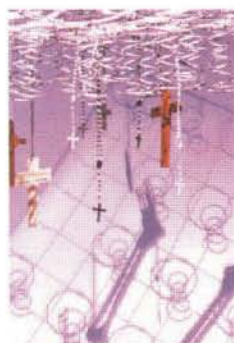
Art Director

Name:	Mark Andrews
Job Description:	Use new computer technologies to help companies design interactive selling tools.
Experience:	Worked with a major automaker to create a CD-ROM which lets prospective buyers configure up to 43 variations on new models.
Key to Success:	"I work when others are shampooing."
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CD-ROM

Saar-Sighted

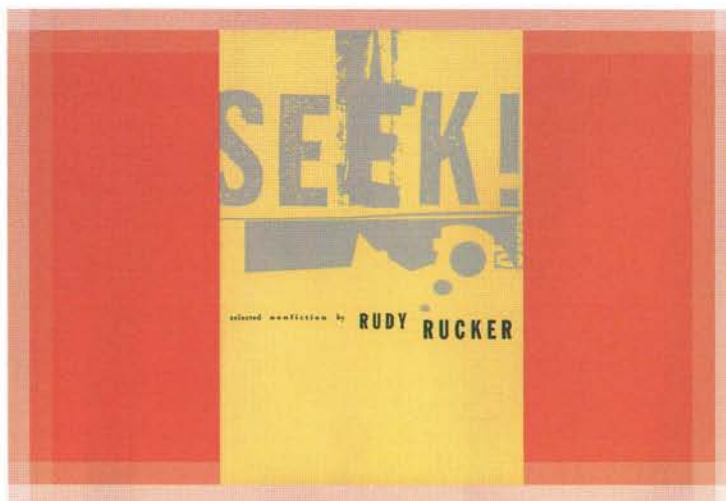
In *Betye Saar Digital Griot*, one of today's most influential and controversial African-American artists positions herself as an information-age storyteller.

A creative interface titled "The Black Girl's Window" allows users to navigate freely through images that reflect Saar's inspirations. In one section, for example, users explore rooms of Saar's childhood home, where she imagined everyday furniture transforming into distorted, dynamic objects — a vision later manifested physically in Saar's surreal "spirit chair" assemblage sculptures.

More linear types can peruse a section containing more than 120 pages of the artist's 1994 notebook, or the comprehensive, neatly organized index of Saar's art and exhibitions to date.

All in all, the disc is an effective and unusual portrait of an artist, one that manages to be didactic and engaging, yet never pretentious or precious. — *Reena Jana*

Betye Saar Digital Griot: \$29.95. Voyager/Learn Technologies Interactive: (888) 292 5584, www.voyagerco.com.



BOOK

The Transreal Thing

Science fiction author-hero Rudy Rucker is an oddity and a treasure. In his new collection of nonfiction, *Seek!*, Rucker explains his preoccupations as mathematician, professor, family man, and limit breaker with a novelist's attention to freaky and convincing details. In these days of neat little marketing categories, few writers attempt to cover so much ground.

Taking its name from the manual for one of his artificial-life programs, the book is a frenzied, sometimes spastic tour of Rucker's life story and driving obsessions. Die-hard fans (of which Rucker has many) love snippets of an author's life, and hero worship aside, it's a pleasure to read the wry and often profound observations of someone accustomed to viewing himself through the filters of sci-fi, mathematics, and a strong dose of unrestrained playfulness. When he narrates a visit to a chipmaking laboratory, for instance, he's impressed by some mechanical arms that portend "robot obstetric wards."

Rucker delivers the facts with whatever funny notions or personal insights strike him, even when they're not so diplomatic. He slags compatriot Robert Anton Wilson for being a self-important grouch; his descriptions of people sometimes include attention to physical flaws worthy of a fairground caricaturist.

The author also indulges in some self-comparisons that would make the modest blush. He likens himself, variously, to William S. Burroughs, Philip K. Dick, Pieter Bruegel, and others. Maybe that's part of the fun of being a science fiction writer: When you've already used self-replicating robots to illustrate the world's social problems, you can get away with using artistic demigods as a way of approaching your own work. *Seek!* is a twist on Rucker's idea of transrealism, his authorial style that uses sci-fi as a setting in which to transform and examine the everyday world. (And rabid Rucker fans take note: Another volume, *Saucer Wisdom*, from Forge Books, is due out in bookstores this summer — a first-person narrative in which the author makes prognostications.)

A life that's deep in the bowels of Silicon Valley manufacturing one minute, partying in a Tokyo cyberpunk bar the next, and later wandering the streets of Antwerp contemplating Bruegel is a rich reminder that the future is now — and that we don't have to abandon the complexity of our selves now that we're here. — *John Alderman*

Seek!: Selected Nonfiction, by Rudy Rucker: \$35 hardcover, \$16.95 paperback. Four Walls Eight Windows: (800) 788 3123, www.fourwallseightwindows.com.



GAME

I, Nicklaus

Jack Nicklaus has been called the greatest golfer ever, and now the one-man links industry offers another high-end golf simulator: *Jack Nicklaus 6: Golden Bear Challenge*. This time out, armchair duffers can play not only against the Golden Bear but also actually as him in round after round of broadcast-format virtual golf, complete with camera-in-camera course views and running commentary by CBS sportscasters Jim Nantz and Gary McCord.

Playing either as Jack or as an imaginary persona with customizable skills, you'll take to the green on six world-famous courses: Shoal Creek, Mentecastillo Golf Resort, Sherwood Country Club, Nicklaus North Course, Cochise at the Desert Mountain Club, and Muirfield Village. Motion-captured 3-D golfers have smooth swings, as well as some 15 unique moves and gestures. The ball physics are also top-notch.

On both the standard courses and those created with the in-game Course Designer, players can turn on and off the ambient detail, including birdsong, crowd reactions, and comments not only from sportscasters but from Nicklaus himself. Hardcore golf nuts will probably turn off these audio goodies as they lose their charm — avian chirps and crowd moans trigger all too predictably, and the shot-by-shot commentary, while a well-meant concept, is downright embarrassing at times. A competent escape from the rough will sometimes elicit a crack like, "That shot had a lot of ugly on it," while a putt in the wrong direction will go unnoticed.

Alas, the wealth of detail and the abundance of options will only confuse casual players. The game lacks an intuitive online tutorial, and if you're not 100 percent sure about the meaning of golf terms like *bogey*, *birdy*, *gimme*, *mulligan*, and *bingo bango bongo*, you'll find yourself, to use golf vernacular, in the heavy rough. But if you dream of laser-thin slices and chip shots, this game will put you on the green. — *Chris Hudak*

Jack Nicklaus 6: Golden Bear Challenge: \$39.99. Activision: www4.activision.com/games/jack.

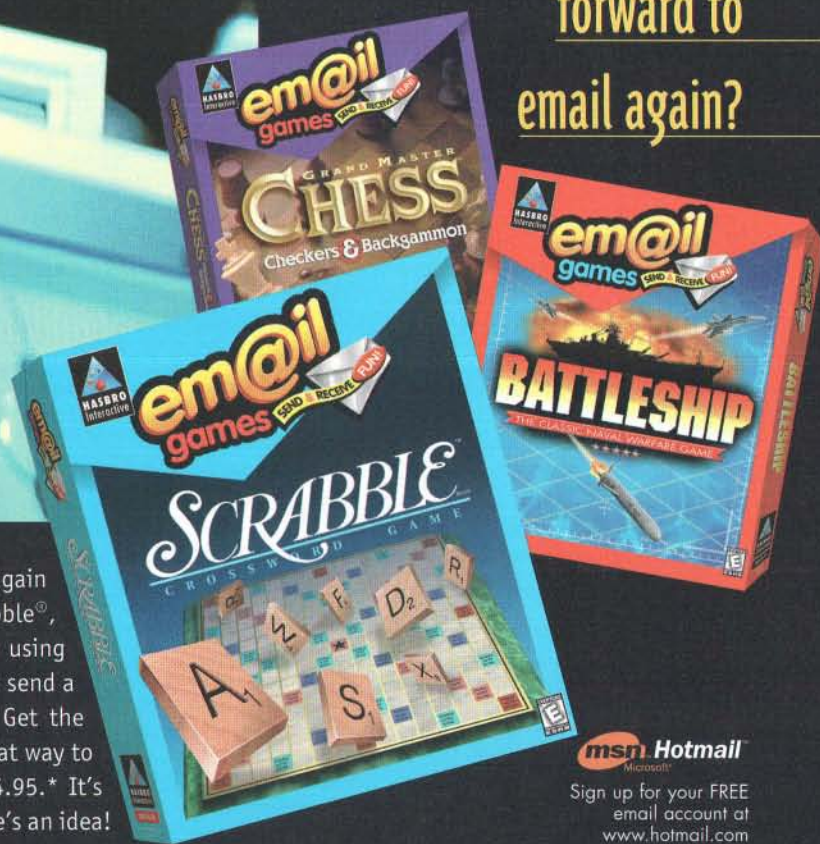


57 work memos.

16 bad jokes.

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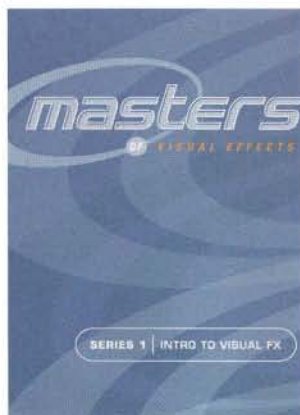


For more info and a free demo, head to: www.emailgames.com

*Approximate Retail Price

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VIDEO

American History f/x

Bow down to the *Masters of Visual Effects*. In a 20-plus-hour, four-part series, the stars of the field talk about creating visual effects, from previsualization to postproduction. Heavy on information, the tapes earn their hefty price for wannabes and aficionados alike. Though I've been working in postproduction for 15 years, I learned a thing or two watching "Post Production Basics."

What makes the series compelling – and legit – is that the masters in question are the real deal. With a flip of the remote, Ron Brinkmann of *Contact* fame appears, and I watch the man who literally wrote the book on compositing talking about how color, shadows, glare, and film grain will affect my images. The visuals aren't fancy – basically talking heads – and listening to the laundry list of tips and facts Brinkmann imparts may have you reaching for the reclining handle on your La-Z-Boy. But hang in there. The film's editors added well-timed jolts of *Mission: Impossible*-inspired graphics from cool independent films and unusual commercials to explain the techniques. – *Debra Kaufman*

Masters of Visual Effects: \$695 for parts 1 and 2. *Masters of Visual Effects*: +1 (415) 705 0858, www.mastersvfx.com.



RELEASE: JUNE

Fast Card

Although notebook computers make the perfect mobile editing suite, Apple hasn't included a way to capture motion images into its PowerBooks. Newer Technology addresses this acute need with a card that'll add a whizzy FireWire port – a ka IEEE 1394 – to any G3 PowerBook.

Newer's \$249 FireWire 2 Go CardBus card speaks FireWire's 100-, 200-, and 400-Mbit-per-second dialects and is just the thing for offloading video from a DV camcorder onto a PowerBook's hard disk. Thanks to Apple's FireWire system software, capturing DV data to disk is a snap on a 300MHz or faster PowerBook G3. Slower PowerBooks may sometimes miss a frame now and then. External FireWire drives are also supported.

The only evident downside of the FireWire 2 Go is that it – like Sony's laptop i.Link ports – doesn't provide power on the FireWire. Then again, no one really wants a video camera draining their PowerBook's batteries anyway. – *Stephan Somogyi*

Newer Tech: +1 (316) 943 0222, www.newertech.com.



RELEASE: LATE SUMMER

Stove-Top Box

Ten years ago Bob Lamson introduced the Juiceman juice extractor by demonstrating it at houseware expos and airing countless infomercials. A few years later, Lamson brought out the Breadman and successfully added "Healthy Bread" to "the Power of Juicing" in buyers' subconscious minds.

With his new startup, CMi Worldwide, Lamson takes on the computer industry. The kitchen-friendly Advantage 2000 looks and works like a regular TV ... but wait, there's more: The info appliance also runs interactive cooking shows on CD-ROM, plays music, sends email, provides a video monitor to check the front door, and pulls up Web pages from its own home-information portal. It even has the capability to control other kitchen appliances, sending signals through power lines using the EHS (European home systems) standard. The CD-ROMs, which are in the video CD format, let you put a beef stroganoff lesson on Pause while you catch up at the cutting board, and you can switch over to television instantly.

Some of Lamson's competitors are Windows based, but the CEO's focus groups told him Windows was the last thing they wanted in their kitchens, so his machine uses Spyglass' browser and a Wind River Systems OS. It feels nothing like a desktop.

Someone is going to wire the heart of the home. Other entries in the household-infoppliance race include Brother's Kitchen Assistant, Qubit from Qubit Technology, and Global Converging Technologies' Cendis Phone. Will it be a computer industry still rooted in business applications, or a man who turned a juice extractor into a best-selling panmedia celebrity phenomenon? At trade shows, Lamson pours coffee onto the Advantage 2000's wireless keyboard to show that it's spillproof. Unlike typical computer-product presentations, this demonstration would make sense to anyone. – *Paul Spinrad*

CMi Worldwide: +1 (206) 448 0354, www.cmiworldwide.com.



RELEASE: JUNE

fleaBay

Having a garage sale Sunday? Hold it online, too. Billpoint offers a way for everyday people to set up credit card transaction areas on their own Web sites. Founded in part by Excite and Classifieds2000 escapees, the company aims to make person-to-person online transactions commonplace.

Billpoint's service is offered on the Homestead site, where you've been able to set up free homepages and add functions like search engines, stock tickers, and weather forecasts. Now you can drag a Billpoint credit card element onto your page, fill out the online form, wait for approval, and – voilà! – start taking Visa. The company charges a small transaction fee for each sale and then regularly sends you checks.

What about fraud? Treachery? Deceit? Billpoint claims to have worked all that out, including payment disputes. And there is a screening process for sellers, though the company says it's quick and painless.

As you come across more Joe Schmo ecommerce sites, you may find yourself wondering, "Is this just some guy selling stuff, or is it a tax-free business?" That's one can of worms Billpoint has opened. But, hey, now you can sell a can of worms online – and take plastic for it. – *Steve Mollman*

Billpoint, on Homestead Technologies: www.homestead.com.



HARDWARE

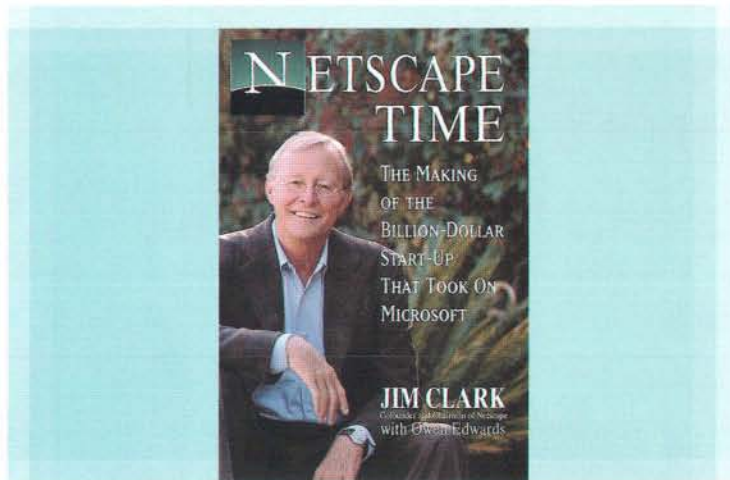
Little Big Screen

Basically a means of holding two tiny LCDs in front of your eyes, i-glasses are the only mass-market competition for the Sony Glasstron, which lets you watch movies on a virtual 52-inch screen. i-glasses deliver an 80-inch experience and cost \$300 less.

The picture is wide but pixelish, though it's acceptable for a DVD like *Lost in Space*. And since the contraption leaves some peripheral vision, I was able to walk around the office and conduct business while hotshot pilot Matt LeBlanc blasted mutants. If your laptop plays DVDs, you can buy the glasses without a player, and that's how this product makes sense.

Manufacturer i-O Display is targeting airline passengers or anyone who wants complete privacy while watching movies or playing video-games. Incidentally, 30,000 of these specs have been sold to dentists for "patient distraction." I can hear it now: "Oh, no, no, the pain – hey! It's the guy from *Friends!*" – Paul Chaplin

i-glasses: \$499. i-O Display Systems: (800) 339 5287, www.i-glasses.com.



BOOK

"It Was Just the Law of Large Numbers at Work"

Jim Clark now admits that he started Netscape without a specific plan – just gut instinct and a \$3 million nest egg. "How could anyone make money on the Internet?" he asks in his new seat-of-the-pants memoir. "I didn't have a specific answer to that yet, but I figured that with the Web- and Mosaic-enabled Internet already growing exponentially, how could you not make money? It was just the law of large numbers at work – even a small amount of money per user would yield a big business." The prescient entrepreneur was betting that home shopping, banking, and other services would be delivered over the Web. The only issue was how to make it pay. *Netscape Time* explores his insights and frustrations as the company raced to answer this billion-dollar question.

Netscape's consumer strategy was the first to go, as Clark was forced to turn to venture capital "velociraptors" to fuel a fiercer-than-anticipated burn rate. Instead of concentrating on the mass market, after closing its first \$7.2 million deal with MCI to develop server products, the company reset its sights on enterprise software. At the time, it was battling a rearguard legal action with Marc Andreessen's alma mater over intellectual-property rights that threatened to put its protean plans on hold.

It was a white-knuckle ride for harried investors. "We were spending over half of our R&D dollars on this one piece of software, so if we didn't charge for it, we had to find some other way to pay for our costs," says Clark. The company would resurrect its consumer-portal strategy 24 months later after coming under siege from Redmond's "evil Lord Sauron."

One corollary of living in Netscape time is that being first to establish a brand is not enough: You have to keep moving at the speed of the media, if only to make it more difficult for competitors to lock on. After starting SGI and Netscape, the 55-year-old entrepreneur is now applying the lesson to his third billion-dollar startup, Healthon, which went public in February and in May announced a multibillion-dollar merger with WebMD that makes Microsoft a significant shareholder. And his fourth venture, MyCFO, is just out of the gate. "An axiom of motorcycle racing applies precisely to the technology business," he muses. "Stability is a function of momentum." – Michael Menduno

Netscape Time: The Making of the Billion-Dollar Start-Up That Took on Microsoft, by Jim Clark: \$24.95. St. Martin's Press: (888) 330 8477, www.stmartins.com.

Contributors

John Alderman (alderman@sirius.com) is a writer, editor, and musician living in San Francisco.

Paul Chaplin is a writer and very occasional performer for *Mystery Science Theater 3000*, on the Sci-Fi Channel.

Paul Clark played keyboards with the Bolshoi and is now the editor of *electronicmusic.com*.

Craig Engler is editor of *Science Fiction Weekly* (www.scifiweekly.com) and an online consultant for the Sci-Fi Channel's Web site (www.scifi.com).

Chris Hudak is a freelance writer and marginal Japanese-language student. His approach to both pursuits is unusual but lots of fun.

Wendy Jackson (wejack@hotmail.com) is a freelance writer, consultant, and educator based in Los Angeles.

Reena Jana is a National Arts Journalism Program Fellow at Columbia University.

Beth Johnson is a senior reporter at *Entertainment Weekly*.

Debra Kaufman (msdk@juno.com) writes and consults about entertainment technology from her Venice, California, cottage.

kenn lowy has written about music and computers for *Rolling Stone*, *Trouser Press*, *Electronic Musician*, and other publications.

Michael Menduno (michael@menduno.com) writes about technology, health care, and ocean exploration from a beach house in Santa Cruz, California.

Mitch Myers (comeback@mcs.com) is a psychologist and a freelance writer. He lives in Chicago and Manhattan and spends a lot of time on the phone.

j. poet (poebear@earthlink.net) writes about world music and pop culture for a variety of publications from a pink Victorian flat in San Francisco.

James Rozzi (jrozzi@gcedunet.gac.peachnet.edu) lives in Atlanta, where he's a musician, a teacher, and a writer with a local jazz column.

Tony Scherman's *Backbeat: Earl Palmer's Story* was recently published by Smithsonian Press.

Stephan Somogyi writes about gadgets, technology, business, design, and numerous other subjects for US and European publications.

Robert Spinrad, a computer scientist, is a former director of Xerox PARC.

Tom Vanderbilt (vandernyc@aol.com) is a contributing editor of *I.D.* and *The Baffler* and author of *The Sneaker Book: Anatomy of an Industry and an Icon*.

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BEST

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Cordless Drills



Black & Decker FireStorm FS632K-2

FIRST CLASS:

Panasonic EY6100FQKW

The 12-volt drill, once used only by industrial carpenters, is fast becoming a home-improvement staple. This profoundly compact Panasonic cordless brings the power to the people while keeping the weight down to 3.8 pounds. And unlike most small drills, it can maintain driving force even at the slowest speeds. Panasonic also throws in a 15-minute charger, a 22-position clutch (say adieu to stripping screws), and a keyless chuck, meaning you no longer need a special widget just to release the bit.

EY6100FQKW: \$328. Panasonic: (800) 338 0552, www.panasonic.com.

BUSINESS CLASS:

DeWalt DW953K-2

Superior ergonomics and finger-friendly button positioning – not to mention DeWalt's stellar reputation – make this little number a keeper. Weighing just 3.8 pounds, it features a reversing-speed, six-position adjustable clutch to keep all 12 volts under your control. A keyless chuck, screwdriver bit, and one-hour charger guarantee fewer expletives per project.

DW953K-2: \$149. DeWalt: (800) 433 9258, www.dewalt.com.

COACH:

Black & Decker FireStorm FS632K-2

This 12-volt FireStorm weighs a mere 4 pounds and packs more than enough power for a weekend fixer-upper. Other bells and whistles include a keyless chuck, a fan-cooled motor, an electronic brake, a three-hour charger, and a secure T-handle design.

FireStorm FS632K-2: \$89.99. Black & Decker: (800) 235 2000, www.blackanddecker.com.

Water Skis



Connolly Mid SX

FIRST CLASS:

Goode 9200

In a sport where equipment size and maneuverability – and especially the ability to stay up on one ski – separate the pros from the masses, this ultraslim single is the choice of champions. The three lengths and eight flex patterns cater to a skier's height, weight, and preferred boat speed. The carbon-graphite composite is half the weight of fiberglass competitors, and from buoy to buoy this ski accelerates faster, rides deeper, slows down easier, and transitions more quickly.

9200: \$910. Goode: (888) 464 6633, www.goode.com.

BUSINESS CLASS:

Connolly Mid SX

The Mid SX rides the wave of fat-boy designs, combining the benefits of a wide, shaped ski (up to 550 square inches) with trick features from Connolly's competition models to make waterskiing a less strenuous endeavor. The platform makes this single ski harder to maneuver than some of the narrower alternatives, but the resulting stability eases the transition from beginner to intermediate.

Mid SX: \$385. Connolly: (888) 234 7547, www.connollyskis.com.

COACH:

HO Sports Easy Riders

With a whopping 900 square inches of surface area, Easy Riders live up to their name by providing effortless deep-water starts and rock-solid stability for newbies. These wide bodies support up to 275 pounds and have standard horseshoe bindings that are easy to adjust in the water. And the option of using them as a pair or as singles makes graduation to one ski a natural process.

Easy Riders: \$280. HO Sports: (800) 938 4040, www.hosports.com.

Ultraportable LCD Projectors



Compaq Personal Projector

FIRST CLASS:

InFocus LP330 Dragonfly

Lunchbox-sized projectors are now de rigueur for the marketing VP on the go, and any roadworthy light box weighs less than 7 pounds. The Dragonfly comes in at under 5 pounds, and its remote control and zoom lens should create quite the buzz. Just click off the lights and power up the unit, and the Dragonfly's bright display (measured at 650 lumens) enlarges computer demos and video presentations to dazzling proportions across a client's conference-room wall.

LP330 Dragonfly: \$6,999. InFocus: (800) 294 6400, www.infocus.com.

BUSINESS CLASS:

Compaq Personal Projector

If the International Olympic Committee ever made Power-Point presentations an event, using this Compaq would constitute an unfair advantage. Tiny enough to slip beside your laptop in a carry-on bag, this 600-lumen projector weighs just 4.2 pounds and has terrific XGA picture quality, not to mention a snazzy magnesium housing. The carrying case also unzips and flops open, so you can begin the meeting within one minute of entering the arena.

Personal Projector: \$4,900. Compaq: (800) 345 1518, www.compaq.com.

COACH:

InFocus LP400

InFocus recently lowered the price of its tried-and-true LP400 – and with it the cost of splashy road shows. At 700 lumens, this gun is brighter than most, and the SVGA resolution is sharp enough for almost any computer or video source. You may, however, want to spend some time at the gym: The LP400 weighs in at nearly 7 pounds.

LP400: \$3,500. InFocus: (800) 294 6400, www.infocus.com.



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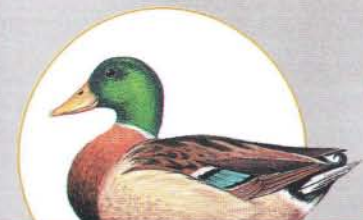
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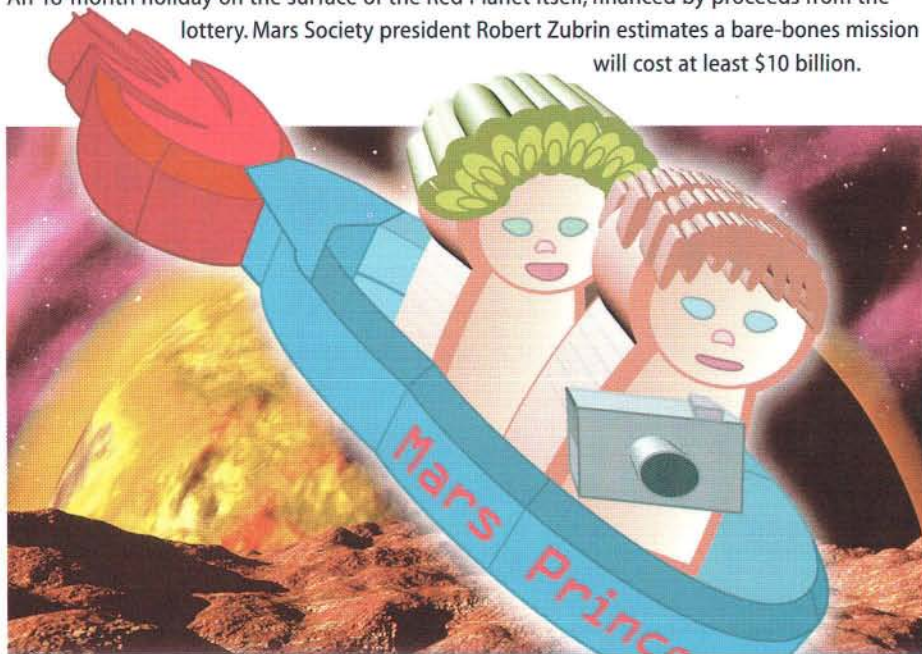
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Creative Financing

T-minus \$10 Billion

For all the tax dollars the federal government squanders on pork-barrel military and highway projects, it's a shame the Feds can't come up with money for cool stuff like a serious hunt for extraterrestrial intelligence or a manned mission to Mars. Maybe it's a lack of Beltway connections or high-powered lobbyists, but endeavors like these stand little chance of getting funding in today's political climate. Big dreamers need a way to raise government-scale moola without recourse to the public teat.

The Mars Society has an idea. Among the topics the group will discuss at its annual meeting this month in Boulder, Colorado, are alternate ways of financing a trip to the fourth rock. The most intriguing of the various proposals is an online Mars lottery. Players would plunk down \$5 or so, with the chance of winning Mars-themed trinkets or small cash payouts. The grand prize? An 18-month holiday on the surface of the Red Planet itself, financed by proceeds from the lottery. Mars Society president Robert Zubrin estimates a bare-bones mission will cost at least \$10 billion.



A \$5 lottery ticket could take you – and some cash-strapped scientists – to the Red Planet.

Zubrin envisions the journey happening in a series of steps, beginning next summer with the creation of a \$1 million Mars training base on Devon Island in the Canadian Arctic. The base, which will test living conditions in an extremely cold and dry environment, is being funded entirely through private donations. Infoseek founder Steve Kirsch and the Foundation for the International Non-Government Development of Space have each chipped in \$100,000.

The next step might be paying NASA to carry a Mars Society payload – perhaps a camera-equipped balloon – on an upcoming Mars probe, due to be launched in 2003. If all goes well, the final step would be a full-fledged six-person mission to Mars: estimated blastoff 2019.

Of course, this plan faces a few obstacles, not the least of which is the law. The National Association of Attorneys General has been leading an effort to get Congress to ban online gambling, including lotteries, meaning that any would-be US Marsnauts would have to be scrofflaws as well.

More troublesome is the timetable. The International Red Cross' Plus Lotto, the game on which the Mars Lottery is loosely based, generates about 6,000 Swiss francs a week – \$4,000. At that rate it would take more than 48,000 years for the Mars Society to raise \$10 billion. – Dan Brekke

The Mars Society: www.marssociety.org.

Investment Ideas

Point-and-Click Angels

No doubt, the Internet is transforming the investment world, but when it comes to IPOs, not all that much has changed. Sure, some online brokers, like E*Trade and Discover, have been successful in snagging small share allocations, letting a lucky few buy in at the offering price. But most people still experience hot offerings in the typical manner: choking on exhaust fumes as the rocket takes off packed with champagne-swilling investment bankers and institutional investors.

Stephen Pelletier, a former Intuit exec, wants to let a lot more people in on the party. Startups have long raised funds through private placements – the sale of pre-IPO shares to wealthy individuals, so-called angel investors. But angel investment has remained constrained by geography. Angels tend to find out about interesting companies through informal personal networks and usually prefer to invest locally – the better to keep close watch on the company's management and finances.

Pelletier's new company, OffRoad Capital, is trying to expand the private placement world. OffRoad's Web site, which went live in March, keeps potential investors informed of upcoming private placements and lets geographically dispersed angels invest with the click of a mouse. It's also a place where investors and management can share info and hash out difficulties. Startups that get financing through OffRoad will host regular chat sessions with their angel investors and will be required to present quarterly reports online.

The market could be huge: OffRoad estimates \$2 trillion in market value is locked up in companies too small for the stock markets but too large to be funded by family and friends. "We're creating an entirely new market," says Pelletier.

You'll need some cash to get into that market, though. Because private placements are inherently high-risk, the SEC requires investors to meet strict financial requirements: more than \$200,000 in annual income or more than \$1 million in assets. OffRoad also charges an initial \$1,000 membership fee and \$250 in annual dues, in addition to stipulating minimum investments of \$25,000. Still, it could be a small price to pay for the opportunity to buy into the next Amazon.com at \$3 a share. – Dick Satran

OffRoad Capital: www.offroadcapital.com.

Online Gambling

Playing the Market

So you like the odds on Wall Street but don't have the cash to play at the high-stakes Internet stock tables? No worries: Now you can bet on the market without buying a single share.

Wallstreet.com, a newly launched Web site, lets financial punters bet on various events, including the closing prices of hot IPOs, the price of gold futures, and whether or not the Fed will raise interest rates. For the moment, Wallstreet.com offers wagering on only a few dozen events in the US markets, but eventually it plans to offer 24/7 casino action on financial markets around the globe.

The site is operated by Global Internet, an online casino management company, on behalf of Simpson Bay, a Saint Kitts-based gaming concern. Global Internet also operates *Playeronly.com*, a popular Internet casino that offers roulette, slots, video poker, and sports betting.

Patrick Carter, a Global Internet manager, says Wallstreet.com addresses a "missing market" – regular Janes and Joes who don't have the resources to directly participate in the financial markets but are mesmerized by the quick money being minted on Wall Street. "They're the ones who get addicted," says Carter.

Maybe. But given Wallstreet.com's tough odds – less than 2-for-1 for predicting the direction of interest rates – small-fry gamblers are probably better off stuffing their pennies into a mutual fund. Not only are the odds better, but investing in mutual funds is legal. In the United States, at least, online gambling isn't.

Account for human nature, though, and it's a sure bet that Wallstreet.com will be a runaway success. The site has already paid out one big jackpot: Three men from Arizona and New Mexico split the \$1.03 million they pocketed by selling the Wallstreet.com domain name to Simpson Bay back in April. The trio paid \$100 to register the name in 1994.

– J. Schultz

Wallstreet.com: www.wallstreet.com.

"The empires of the future are the empires of the mind."

– Winston Churchill

The Wired Index



May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May
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The Wired Investment Portfolio

Summer Sale

As the market wilts under a summer sell-off, I refuse to join the herd. Instead of selling anything, I'm going bargain-hunting. AT&T, in particular, looks cheap, so I'm deploying some idle cash to buy 3,000 shares. CEO C. Michael Armstrong is to be commended for his broadband-savvy purchases of TCI and MediaOne. With TCI, AT&T also got 26 percent of the newly formed Excite@Home, making AT&T a safer way to ride the @Home roller coaster. Given Armstrong's

track record and the impending broadband explosion, I see this as a great core holding.

Another great buy: Drug Emporium, the 140-store brick-and-mortar chain that has been selling prescription meds online since last October. Given the market's interest in online drugstores and Drug Emporium's \$127 million market cap, I think the stock is poised for a nice upward pop. I'm in for 12,500 shares. – Jeffery Wardell (jwardell@hamquist.com)

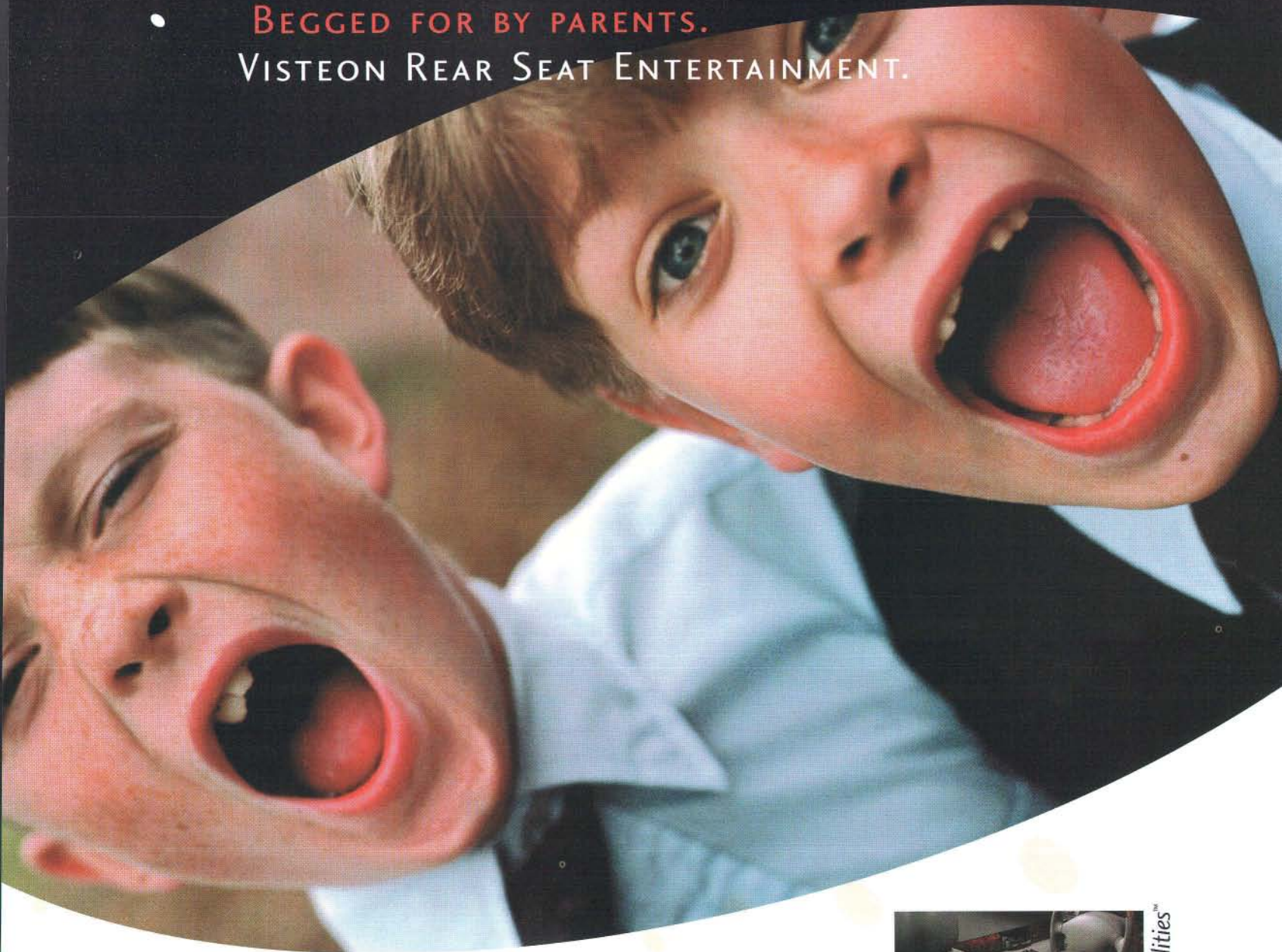
Company	Primary Business	Symbol	Shares	Close 6/1	Current Value	Δ Since Purchase
HOLDING						
Abbott Labs	Pharmaceuticals	ABT	2,500	44 3/4	112,188	– 2%
America Online	Online services	AOL	5,000	113 1/4	565,625	+343%
AT&T-Liberty Media A	Cable programming	LMG/A	3,000	66 1/4	198,750	+ 1%
Autoweb.com	Ecommerce	AWEB	6,000	15 9/16	94,875	– 34%
Cisco Systems	Network hw/sw	CSCO	4,500	107 1/16	481,781	+166%
FDX*	Freight delivery	FDX	2,500	56 3/4	142,188	+ 31%
Guidant	Medical devices	GDT	2,500	49 9/16	123,906	– 15%
Merck	Pharmaceuticals	MRK	2,000	68 1/8	136,250	– 15%
Microsoft	Software	MSFT	4,000	78 1/2	314,000	+ 87%
Network Associates	Virus sw	NETA	10,000	14 9/16	145,625	– 34%
Pfizer	Pharmaceuticals	PFE	1,500	106 1/8	159,563	+ 8%
BUYING						
AT&T	Telecom services	T	3,000	55 1/16	165,188	
Drug Emporium	Ecommerce	DEMP	12,500	9 3/8	120,313	
Cash	\$712,248	Portfolio Value 6/1	\$3,472,500			
		Portfolio Value 5/3	\$3,692,251			
One-Month Portfolio Performance				–5.95%	Russell 2000 Index	+0.960%

This fund started with \$1 million on December 1, 1994. Profits and losses are reflected monthly. *Two-for-one stock split
The Wired Investment Portfolio (formerly TWITS) is a model established by *Wired*, not an officially traded portfolio. Jeffery Wardell is a senior vice president in executive financial services at Hambrecht & Quist LLC and may have a personal interest in stocks listed in the WIP. The opinions expressed herein are those of the author and not necessarily those of H&Q's research department. H&Q has not verified the information contained in this article and does not make any representations as to its accuracy and completeness. *Wired* readers who use this information for investment decisions do so at their own risk.

INSPIRED BY KIDS.

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Making Waves

◀ 151 in New Braunfels, Texas. The Schlitterbahn's Flow Rider relies on two Flygt submersible pumps – staples in sewage-treatment plants – that shoot 100,000 gallons of water per minute up a curved surface made from a material that feels like a gymnasium mat. (It's actually rigid, closed-cell urethane foam, but it has a little give to it.) The thin sheet of chlorinated water travels at 15 to 30 mph, creating a stationary wave with a sheet of water gushing at about twice the speed of a similarly sized, breaking ocean wave. The wave, which spills into an artificial river, was an instant hit with bodyboarders, boosting park attendance by nearly 25 percent.

Almost from the day the Schlitterbahn Flow Rider was up and running, Lochtefeld began trying to stand up on his bodyboard and surf the Flygt-powered deluge. To help him out, Ekstrom began carving up bodyboards, looking for a shape on which he could better keep his balance. Thus was the flowboard born.

“The goal has always been to surf real waves,” says Lochtefeld. That’s “real” as in “real man-made.”

Today, Ekstrom tops these boards with ethylene vinyl acetate using a process invented by his collaborator, Stanley Pleskunas. The core consists of Divinycell, a polyvinyl chloride foam. Just as surfboard cores have reinforcements called stringers, flowboards are constructed with stringers of pultruded fiberglass. Over the years, Lochtefeld has invited friends to test the boards, and twice he's extended that invitation to me.

The Flow Rider in Vista, California, is part of a water park called the Wave, about 10 miles inland from some of the best ocean surf in San Diego's North County and about 30 minutes from Wave Loch's attic HQ. It doesn't make a very big wave – it's about 4 feet tall – but it's plenty challenging. The first time I tried flowboarding on it, I flailed madly. The second time, Lochtefeld advises me to begin by sitting down in the middle of the wave and then shoving the flowboard beneath my feet. With the water racing underneath me and spray flying, it takes some effort, but I finally manage

it. Sitting down on the flowboard, I can easily steer the board by placing my weight at the edge of the direction I want to turn toward. Once I get the feel of that, I try to stand and turn, but my body flies into the air and slaps the mat. I do this dozens of times – and, I imagine, begin to resemble a drunk at a bar bucked off a mechanical bull again and again, laughing and feeling no pain.

After two hours, however, my body finally decodes how to stand and turn. I ride one wave to my satisfaction and finish exhausted and sore, but with that blissful, surfed-out afterglow. It's not surfing by a long stretch, but on a bad surf day, I'd pay good money to do it.

To create the Swatch Flow Rider – the one now making the rounds in Europe – Ekstrom again began with a 2-foot-square scale model. In his studio, Ekstrom sets the model atop a 44-gallon trash can on wheels that's half filled with water. He dips some tubes from the model into the water and turns the little machine on. A sheet of water shoots at the curved wall. He adjusts a few knobs and a wave magically

appears. It's a left, meaning that the wave, if looked at from the “shore,” breaks from left to right. He tweaks the knobs until the shape, from a surfer's perspective, becomes ideal.

Ekstrom picks up a miniature plastic surfer a local company sells as a car-antenna adornment. He has attached a sturdy piece of wire to this surfer, whom he calls Laird, a reference to tow-in surfing pioneer Laird Hamilton. (Hamilton and his friends use Jet Skis outfitted with ropes to drag surfers into mammoth waves that break on Hawaii's outer reefs.) Ekstrom lifts Laird by the wire, delicately places him on the wave, and guides him in fluid turns up and down its face. “Look at this guy!” Ekstrom announces. “He's just ripping!”

He hands Laird to me. “It's not easy your first time,” Ekstrom warns, but after a few minutes I've got Laird dialed in, comfortably doing roller coasters and sick tube rides. I am mesmerized. I am not so much controlling Laird's maneuvers as I am allowing them to happen. It is this sense of going with it, clicking into

the groove, finding the line rather than drawing it – of flowing – that most deeply satisfies me when I surf. I'm micro-flowboarding.

With the model, Ekstrom and Lochtefeld are constantly finessing the physics of flowboarding, and they say it's just about ready for prime time. The boards are almost there, and with any luck, flowboarding will be public within a year. But, he says, “the invention of sheet-wave technology was more a half step. The goal has always been to get to surf real waves.”

But that's “real” as in “real man-made.” And to get there, Dave Skelly believes the best approach is to return to the ocean. For the past four years, he's been designing and lobbying for an artificial surfing reef that would be situated right beneath the jets taking off and landing at LAX. And for the past several months, Lochtefeld's been supporting Skelly politically, helping him build a base of like-minded surfers who can confront opposition to artificial surfing reefs.

Skelly, 45, a mustachioed, 230-pound walrus of a man, is gregarious, opinionated, and turned up a little higher than the laid-back Lochtefeld. “Tom and I are trying to take the dreams lots of surfers have and change the sport,” he says. “We're about to take a quantum leap into the 21st century with this.”

Unlike the self-taught Lochtefeld, Skelly has a more accredited technical background. He worked at the Scripps Institution of Oceanography for 17 years, and under a contract with the US Navy, he and another Scripps researcher and surfer, Scott Jenkins, worked up models for tactical harbors, temporary safe havens for ships in combat. These structures called for submerged breakwaters made of specially designed sandbags or other structures that could be assembled on the spot.

Artificial reefs are not entirely new – no more so than rock jetties or walls built to protect marinas and beachfront property. But artificial reefs built expressly for surfing are new, and while a number have been proposed in New Zealand, Australia, and the UK, only one – the Cables Station Artificial Surfing Reef in Australia – has been completed. Sponsored by the state government of Western Australia, the Cables reef was built by placing a boomerang of granite over an existing limestone reef. The old reef was too far below the surface – waves break when ocean swells move into shallower water – but the new wall makes 186 ▶

INTERNET SALES \$18.2 BILLION IN REVENUE/YEAR \$18.2 BILLION IN REVENUE/YEAR
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Making Waves

◀ 184 the reef taller and is designed to form the swells into surfable waves. What's more, the boomerang generates both lefts and rights, which you can watch roll in on the designers' Web page (www.msr.wa.gov.au).

The structure Skelly wants to build is known as Pratte's Reef. It owes its origins to a \$25,000 donation Yvon Chouinard made to the Surfrider Foundation back in 1989. Chouinard, founder of the Patagonia clothing company and a surfer, commissioned a study on the possibilities of making artificial ocean waves. Surfrider, a group formed by surfers to protect the marine environment, had, as one of its stated missions, "enhancing wave-riding opportunities in ways which will not adversely impact nearshore ecosystems." The notion of building artificial reefs fit right in.

The reef studies might have remained an academic exercise, however, if it hadn't been for El Niño and a longtime antagonist of the environmental movement: the oil industry. During the winter of '82-'83, unseasonably

with 90 to 100 sandbags made from woven, high-strength polyester fabric. By studying the ocean floor at the site and analyzing wave records from the area for the past few years, Skelly believes that he has identified the best place to sink the bags. He has determined how steeply to shape the V by taking advantage of a landmark analysis of waves done in 1974 by then PhD candidate Kimo Walker, who studied the angle of the reefs at such classic and varied Hawaiian surf spots as Pipeline, Waikiki, and Queens. Walker's analysis detailed how steeper "peel angles" – the difference in degrees between the swell and the reef it's hitting – create steeper, better waves.

Each 10-foot-by-7-foot bag will contain 18.5 tons of sand and stand 4.5 feet tall. Skelly plans to drop the bags off a barge outfitted with a crane. By carefully moving the barge parallel to the beach, Skelly hopes to control where the bags drop. At the end of each day during construction, scuba divers will inspect the bags to make sure they have landed in the expected location. Straps that gird the bags will allow the crane operator to move any that

a water park – a refuge. Think of waves as a precious natural resource.

Surfers, of course, already see waves as a precious resource, but some have serious reservations about solving the scarcity with artificial reefs. Scripps' Jenkins, the former environmental director of Surfrider, worries that allowing the creation of reefs for surfing might give developers a "mitigation strategy" for the future: Destroy this wave, build another one here. He also predicts that an artificial reef will lead to lawsuits. "If someone gets hurt, the first thing they're going to do is say an unnatural thing caused this accident," says Jenkins. "It's a sitting duck for an ambulance chaser." Still, Jenkins doesn't actively oppose Skelly's scheme; others do.

Gordon LaBedz, a Long Beach physician who has been with Surfrider since its inception, argues that artificial surfing reefs encourage messing with the ocean by groups that don't care one whit about surfing.

"We have to take the moral high ground and say, 'Leave the beaches natural,'" says LaBedz. "Once you take the opportunistic stand that it's OK to build things in the surf zone, you leave yourself open." As LaBedz sees it, Chevron's \$300,000 won't cover the costs; even if Pratte's Reef gets built, he thinks the ocean will have its way with the structure. "Anytime you're dealing with things in the surf, you're dealing with Mother Ocean, and she doesn't fuck around," he says. "When she wants to build 10-foot waves, she does so and takes out everything in her way."

Skelly contends that his reef can well withstand most of what Mother Ocean might serve up, and says the structure could actually benefit the marine environment. Beaches in California have been steadily losing their sand, mainly because the damming of rivers has dramatically reduced the natural flow of silt. The reef, Skelly says, could dissipate the energy of waves farther out at sea, slowing some of the erosion. Sand would also naturally accumulate in the "shadow" of the reef, creating larger beaches. New sea life might move in, too, offering new places to dive or fish. And if that turns out not to be true, and any harmful effects are detected, he'll simply slash the bags, releasing the sand. "It could be done in a way so that it's a win-win for everybody," says Patagonia's Chouinard. ■ ■ ■

"Mother Ocean doesn't fuck around," says a critic of artificial reefs.

"But when she wants to, she does."

warm water in the Pacific Ocean created a particularly powerful El Niño. (El Niño conditions lead to massive storms and thus massive waves.) Chevron runs an oil refinery off the beach in El Segundo. During that winter, the waves removed a tremendous amount of sand from the beach there, and Chevron became worried about protecting its operation. The California Coastal Commission granted Chevron's request to build in front of its plant a new rock groin that stretches 900 feet into the ocean.

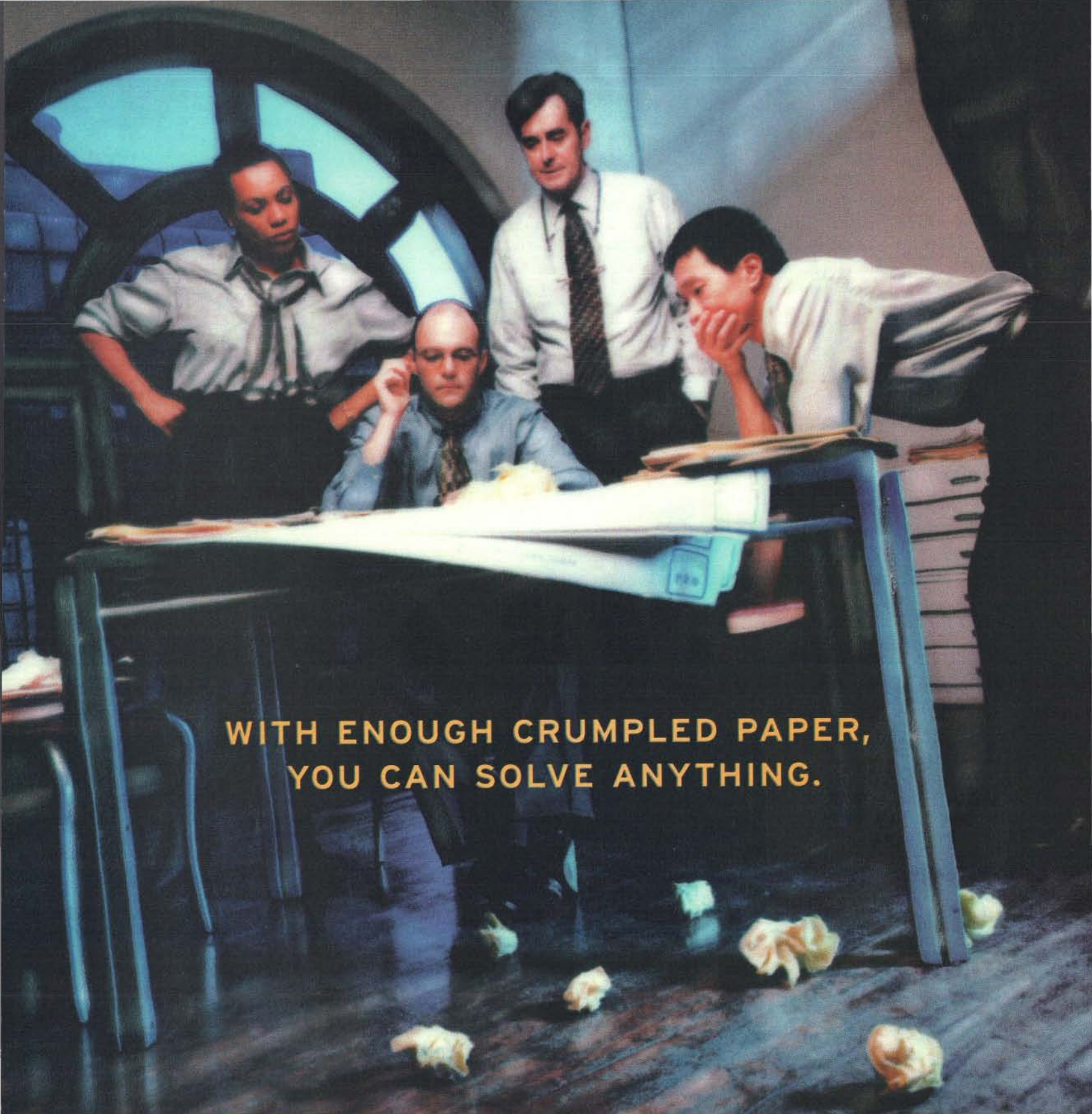
Following a campaign led by local Surfrider member Tom Pratte charging that the groin ruined several surf spots, however, Chevron eventually agreed to give Surfrider \$300,000 to build an artificial reef as a "restoration project" – to create new surf spots to make up for the ones it flattened. Skelly came on the scene in 1995, when he won a small competition to design the reef.

Skelly's plan calls for a reef 350 feet offshore. If all goes well, Skelly will form a V-shaped reef

did not settle in the right place. When it's done, each arm of the V will extend 150 feet. "You'll be able to see this when you take off at LA International Airport," says Skelly. "It will be the size of a small warehouse."

In January 1999, Skelly finally secured the necessary permits to build Pratte's Reef, but Chevron has ponied up only one-third of the \$300,000 it promised. Chevron spokesman Rod Spackman, however, says he's "100 percent confident it will happen."

Still, Skelly and Lochtefeld know this is a onetime deal. "There's no money in engineering surfing reefs," he says. "How can we get the end-line user to pay? You aren't going to. You're not going to put a turnstile out there." The two agree that the best way to offset the costs of building surfing reefs is to tie them to issues like coastal erosion, habitat preservation, and diving and fishing, and to enlist people passionate about protecting their beachfront property and marine life to fund their projects. Think of an artificial reef as



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The New Cool

◀ 155 Web Consortium and Tom Leighton's algorithms group both have their offices. In 1995 Tim asked Tom if he thought distributed algorithms could reliably solve the hot spot problem, and Tom's algorithms posse was intrigued. The problem raised interesting theoretical issues, the group's forte, while at the same time the graphs of nodes and edges they drew on whiteboards represented actual machines and Net connections. Real-world relevance! Several semesters and ideas later – some published, some still proprietary – Tom and Danny had blueprints for server software that would cool down traffic everywhere. But better, they had formally proven that most of their algorithms were optimal. In other words, different solutions might give equally good results, but none could ever possibly do better.

For their nonoptimal algorithms, Tom and Danny demonstrated that the problems were, in computer-science shorthand, "hard" problems. This means there are no major short-

cuts to finding the best solution; the problem is inherently difficult, and you just have to do the best you can with finite time and computational resources.

for publishers, content providers, and e-commerce companies of all kinds, not a software company. With Akamai's service, publishers could forget about servers and ISPs, and concentrate on content. Akamai would run its software on its own broadly deployed server network and sell guaranteed fast delivery, subscription style. The idea was to work with as many ISPs as possible to create a new layer of infrastructure on top of the Net, a fluid system that would run everywhere and reach out to remote populations.

Small ISPs operate at a single location; the big ones have their own subnetworks encompassing multiple POPs in different locations. Both are basically facilities where a bunch of servers share one or more network connections. Akamai calls these facilities "regions," and to get close to all users, the company tries to locate its servers in as many regions as it can. Singapore's Sing-Net has Akamai servers in its single region, while Teleglobe has them all over. Partnering ISPs small and large benefit from improved capacity, while their users get faster delivery

elements, the rationale being that these larger files cause the traffic jams, while plain HTML is fast and cheap. In a big cafeteria, FreeFlow might pick up your meat loaf, green beans, and rice pudding at three different counters, calculating which steam tables look hotter and where the lines are long. But your tray, the HTML, always comes from the same place. Keeping the HTML on the home server also keeps the user database and customization scripts in one place, where publishers want them.

When a user requests a file, the mapping servers decide on a content server in two stages: They choose first the best region and then the content server within that region. In computer-science terms, the first stage represents a classic "min-cost" flow problem, where the cost associated with each hop between neighboring regions – or how easy it is for traffic to flow between them – is weighted. As traffic conditions change, the mapping servers update these weights and continually find a low-cost route based on a user's place on the network. As Akamai and Sandpiper both know, this is an expensive, "hard" calculation. The mapping servers have to be fast.

Within a region, for the second stage of routing, the system divides the traffic evenly among all the servers using "consistent hashing," a wonderful double-randomized hashing algorithm that Danny invented, earning him MIT's 1998 Morris Joseph Lewin Award (no relation) for best master's thesis. Simple hashing algorithms, which assign objects to locations the way a card dealer deals out hands, break down completely when players drop out or come in; the original formula for who will receive what card, which relies on knowing the number of players, no longer works. But consistent hashing splits up and mixes the assignments so thoroughly, while still using a fairly simple formula, that if locations drop out and throw things off, the correct location will still be close by. As more server problems and network glitches arise, the algorithm has to do more second-guessing, but it achieves the best results possible in an unsteady environment.

Routing and spreading the hits intelligently is important, but it isn't the whole solution. The real hot spot cooler is balancing the content load – determining which servers should have which files in the first place, before they fulfill requests routed to them. Akamai's 190 ▶

IT WAS A SOLUTION THAT WAS LITERALLY – DEMONSTRABLY – UNBEATABLE.

cuts to finding the best solution; the problem is inherently difficult, and you just have to do the best you can with finite time and computational resources.

Lastly, Tom and Danny knew with total certainty that, given their descriptions of the hot spot problem and the workings of the Net, the larger the network grew, the better their solution would perform. They not only had a solution, they had a solution that was literally – demonstrably – unbeatable.

LA SAUCE EST TOUT

The name Akamai means "clever" in Hawaiian, or more colloquially, "cool." At Danny's suggestion, the team found it by trying out words in an online English-Hawaiian dictionary. In a sense, FreeFlow is an attempt to put smartness into the Web page, the URL, and the network itself.

Although at first Akamai's founders imagined selling their traffic-calming solution as server software – ISPs would buy it and install it themselves to boost performance – they soon realized they should be a service

of FreeFlow sites. (The company targets content providers and e-commerce sites, but hopes to cultivate an Intel-style status among consumers as well, who would look for ISPs with "Akamai Inside.")

So Akamai servers are in diaspora, but they remain clannish. They keep in constant contact with each other all over the map, speaking their own special dialect of Linux. Each region has one mapping server and one or more content servers. All content servers, no matter where they are, are eligible to serve any content. The mapping servers monitor the local state of the network: How fast are the current connections to neighboring regions? Which connections seem to have gone down completely? They figure out which servers should carry which files, and then how to evenly distribute the hits for a requested file among the servers that carry it.

Web pages themselves break down into units: the HTML page plus each embedded file it contains – images, animations, sounds, video. Akamai's system wisely leaves the HTML alone and scatters only the embedded

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The New Cool

◀ 188 solution replicates the popular files on multiple servers, spreads total loads evenly, and minimizes copying files around. The ingenious algorithm underlying this process is Akamai's secret sauce, and as the French say, the sauce is everything.

CAMBRIDGE DONS

Underlying algorithms aside, a private network service business is a different beast entirely from a software business – for one thing, it requires far more money.

Discovered by Battery Ventures through MIT's student-run "\$50K" Entrepreneurship Competition (the Akamai team failed to win the trial's whopping \$50,000 grant for starting a new business, though the winner turned out virtuous and offered to split the take with the four other finalists), Akamai later secured funding from several angel investors. Among them were Gil Friesen (formerly of Classic Sports) and Art Bilger (formerly of Apollo Fund and New World

AKAMAI WANTS TO BE EVERYWHERE: SAYS PAUL, "A SERVER IN EVERY POP."

Communications). Polaris Venture Partners of Boston and Seattle also joined, and by the end of 1998 the startup had more than \$8 million in first-round funding.

The talent snowballed. Battery Ventures' Todd Dages recruited Paul Sagan as chief operating officer last January. In March David Goodtree joined as head of marketing, after years of studying the IT industry at Forrester Research. In April George Conrades became Akamai's CEO and chair. At BBN George had overseen the acquisition of Genuity, authors of the traffic-management software tool Hopscotch, and when he learned about Akamai, it seemed the perfect big-thinking, out-of-the-box idea: a Hopscotch for the entire Internet. Everyone believed.

Today Akamai employs about 130 people. Many are MIT students, both graduate and undergrad. But alongside them in the trenches is a surprising number of actual faculty on temporary leave – full professors and associate professors from places like MIT, Carnegie Mellon, and UC Berkeley.

THE SANDPIPER APPROACH

Akamai and Sandpiper are not the first in their field of distributed traffic management. Older systems, many still available and useful, perform sophisticated routing and load balancing over groups of servers installed on a single subnetwork. Companies like Cisco (DistributedDirector), GTE Internetworking (which acquired BBN and with it Genuity's Hopscotch), and Resonate (Central Dispatch) have been selling such solutions as installable software or hardware. Digex and GTE Internetworking (Web Advantage) offer hosting that uses intelligent load balancing and routing within a single ISP. These work like Akamai's and Sandpiper's services, but with a narrower focus.

But only Akamai and Sandpiper are selling the service of whole server networks spanning numerous ISPs, and only Akamai and Sandpiper use the trick of rewriting URLs as a hook into the alternative system.

Both companies' services are powerful, but they're not identical. Footprint customers specify which part of their content the sys-

tem should handle by defining rules through a user interface, rather than by adding tag lines to page source. Sites project expected traffic levels ahead of time and pay for levels of service, rather than paying by the meter.

Footprint users can choose from many content distribution options – some simple, some advanced – for different parts of a site, while FreeFlow optimizes everything automatically. Footprint also distributes HTML, not just embedded files, spreading database information through the network. Akamai leaves HTML at home.

Under unusual circumstances, Footprint may be less bulletproof than FreeFlow, but it has proven itself well. It kept *The Starr Report* available on the *Los Angeles Times* site, when many others buckled, and served Intuit's site reliably all through tax season. As long as speed is scarce on the Net, the two companies are going to find fans.

Both companies, if they continue to grow, will route traffic more efficiently over the Net as a whole, increasing delivery speeds for subscribers and nonsubscribers as well. But

there's a downside. Content delivered via these subscription-based networks will make content routed by the old, free Internet seem slow. A page that loads in six seconds seems fine until you visit one that loads in four. This effect will be magnified as people upgrade their connections to DSL and broadband cable. With fatter pipes, users will demand more information-intensive experiences, and the newly available last-mile bandwidth will be filled up with fast, dazzling content from supersites, served from networks like Akamai. ESPN.com will appear instantly, but you'll have to wait an age for anything home-grown or poorly financed.

Others argue, however, that the Internet is already a tiered environment, where cash-rich content providers can add more and more hardware to improve delivery, while your cousin's homepage, with no traffic management resources behind it, is already slow. Akamai and Sandpiper just allow more publishers to tap into premium services.

Either way you look at it, the stakes are high. The winner, if there is one, will have its hand in the major revenue-generating sites on the Web. More than any other company in the medium's short history, the winner will own the Net – or at least the parts of it that pay.

SEA CHANGE

Akamaiians compare their company to FedEx, delivering content faster and more reliably than the old USPS. It's not a bad comparison – as good, at least, as the glorious advent of sea travel thousands of years before Christ – but it raises the specter of huge capital needs and about 10 more years till ubiquity.

Yet in less than a year, the little-known company is well on its way toward global domination. Akamai wants to be universal, as widespread as the Net itself, with, in Paul's terms, "a server in every POP." If the company has its way, every computer on the Net will connect to Akamai servers, which will push and pull content around with the tides, constantly running calculations on the turbulence and fluid dynamics of information. As each new site and ISP signs on, Akamai's ocean will swell, carrying ships ever closer to their final goals. For now at least, the ordinary user ought to be glad that the company in charge of the Earth's oceans wants only to give each of us beachfront property. ■ ■ ■

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ANTIQUA QUILT.

HOUSEWIFE
PUMMELS
BANKER FOR
18TH CENTURY
FOOTSTOOL.



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Hyperfliers

◀ 163 spotter," who still holds out hope that teleconferencing will slay the mighty airline beast. "You're mistreated at the counter checking in," she begins. "It's impossible to get an upgrade. The food is terrible. The attendants cross their arms while you try to store your bags in first class. The bathrooms are filthy. And don't even think about looking down in that little area where the tray tables are stored. Everybody who flies is going *uchh!* They've had it with the airlines. The airline industry is *over.*"

Air rage may be the next

big trend, but the industry outlook is robust. Videoconferencing will have to improve a lot before it has an impact on air travel, and for the near future, that isn't happening.

"The future is already here," says Jonathan Schlesinger, president of Connexus. "The current technology won't change much in 10 years — you'll still see someone on a screen; you still will not be able to touch them or be in the same room." The delivery system may change, perhaps to

offer \$10,000 seats on the Concorde). Meanwhile, Boeing's explorations of high-speed commercial transport have been shelved; NASA cut funding last January because of noise problems. In other words, "aviation has reached a dead end" in terms of immediate tech advancements. Boeing spokesperson Mary Jean Olsen admits: "For the next 25 years, you can expect planes to stay basically the same in terms of the speed and the way they look." (If anything, you can probably expect planes to become increasingly dysfunctional in the years ahead. As one flight attendant confessed on a recent flight: "We never fly anymore with everything working. Business is so good, they just want to keep the planes in the air. Movies, footrests — if it's not a no-go item, they just leave it broken.")

So this is your life, hyperfliers; deal with it. The airlines, kind souls that they are, will provide one enhancement: They're going to entertain the hell out of you on the plane. Michael J. Wolf, a consultant with Booz-Allen & Hamilton and the author of *The Entertainment Economy*, points out that it's already happening: Last year, Wolf notes, the airlines spent \$2 billion on installing entertainment systems.

"Airlines feel they can crowd more people in, as long as

The stationary elite use their power to stay put: "Who-goes-to-whom is important."

Internet-based, "but as long as the quality's the same, who cares how it's done?"

Most likely, infotech will continue to be the unwitting ally of airlines. Nothhaft predicts that as satellite feeds improve real-time email and fax and access to the Internet, "we can be more productive on planes — so we'll travel even more." Saffo offers this surreal vision: "We will spend all our time in airplanes, and we will videoconference from the plane with our travel agents on the ground. We'll just go round and round, and the plane will never land."

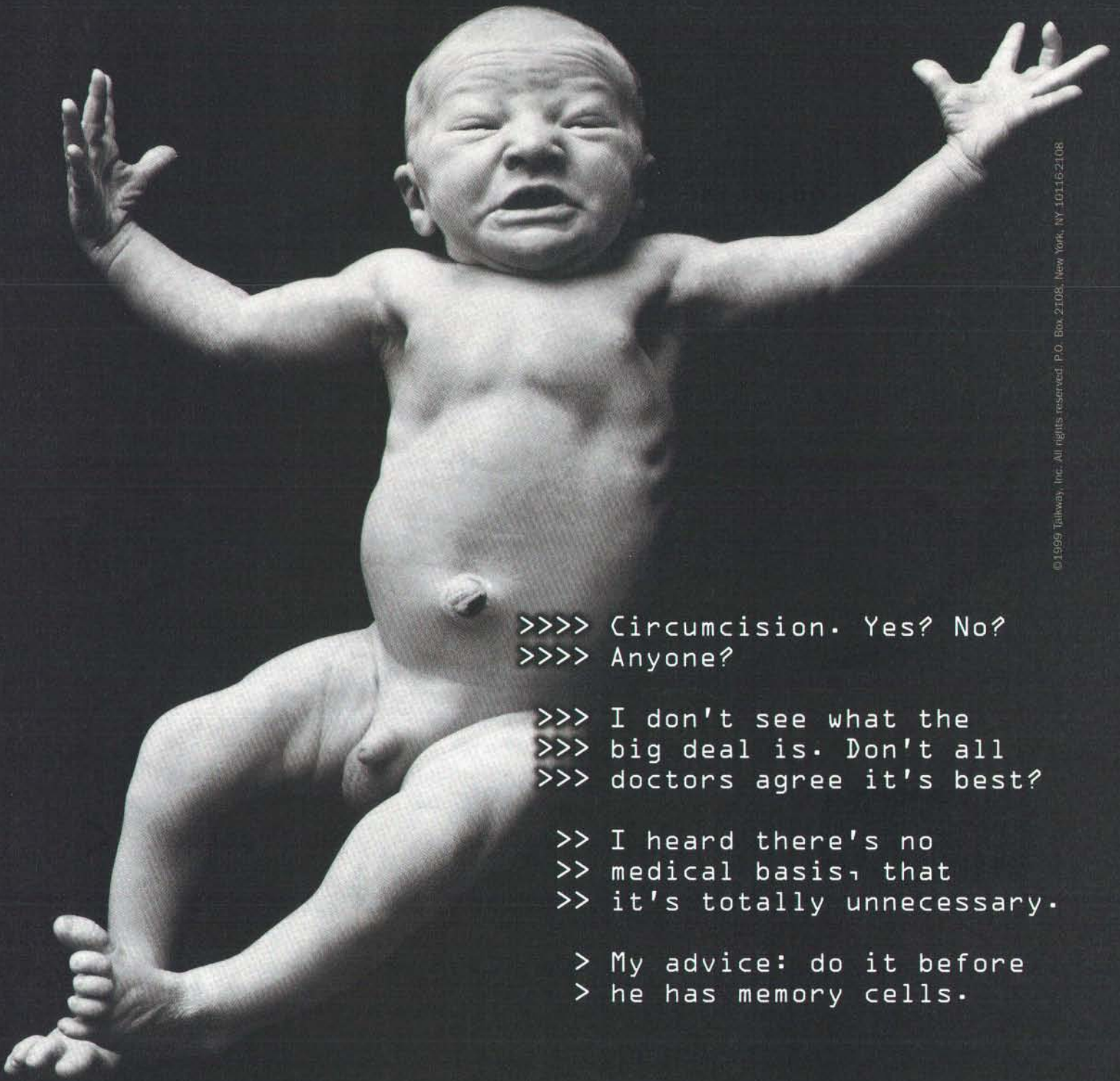
Assuming that more flight is inevitable, there is, of course, still the hope that the experience will improve through better aero-technology. Someday, we may take off in VTOL (vertical takeoff and landing) planes with swiveling engines and downward jet propulsion. The plane will lift off vertically, which won't require a runway — hence we won't have to wait for the runway to clear. Once airborne, we may be flying at supersonic speed, or we may be in a "hyper-soar" plane with an air-breathing engine that accelerates to high altitudes then coasts in space, with the engine reactivating as soon as it reenters the atmosphere. All of this is going to happen, without a doubt, says Stanley Hiller, whose Hiller Aviation Institute brings together top aviation experts to project future developments.

But it won't happen soon. For now, supersonic travel is impractical and unaffordable (British Airways continues to

they give them something to do in their seats," says Wolf. That means not just 20 channels of movies-on-demand, but other forms of diversion — including gambling (seat-back keno and blackjack screens are already being tested). The whole focus "is not to get you there faster," says Wolf, "but to entertain you more, and get more revenue out of you, along the way."

Some hyperfliers are not

amused. Downes predicts a war with the airlines. "They've got the guns, but we've got the numbers," he says. Yet this assumes that fliers, who've been splintered by class and set against one another, could somehow unite. Not likely. The more credible scenario is that part of the culture — the most powerful, wealthiest part — will simply secede. You can already see this happening in the Virgin "Clubhouse" at Newark airport, where a pair of unmarked black doors is the gateway to a walled-off community. As I pass through the hushed room inside, there's a gourmet buffet on my right serving marinated sliced beef fillet in a Madeira sauce. To my left, there's an enclosed entertainment booth where a few people are lounging on a sofa watching a James Bond film on DVD with surround sound. (In London Heathrow's version of this lounge, you can practice your turns on a simulated ski slope, or flop 211 ▶



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>>>> Anyone?

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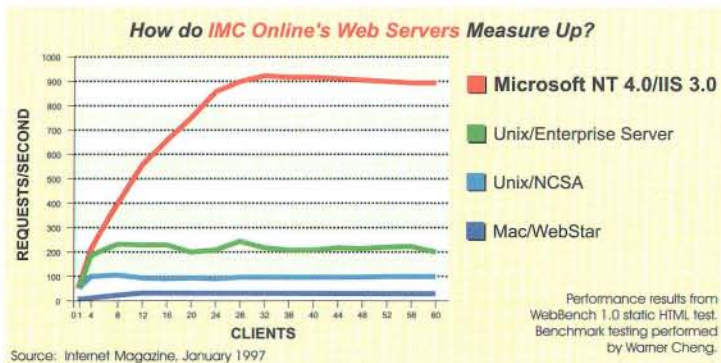
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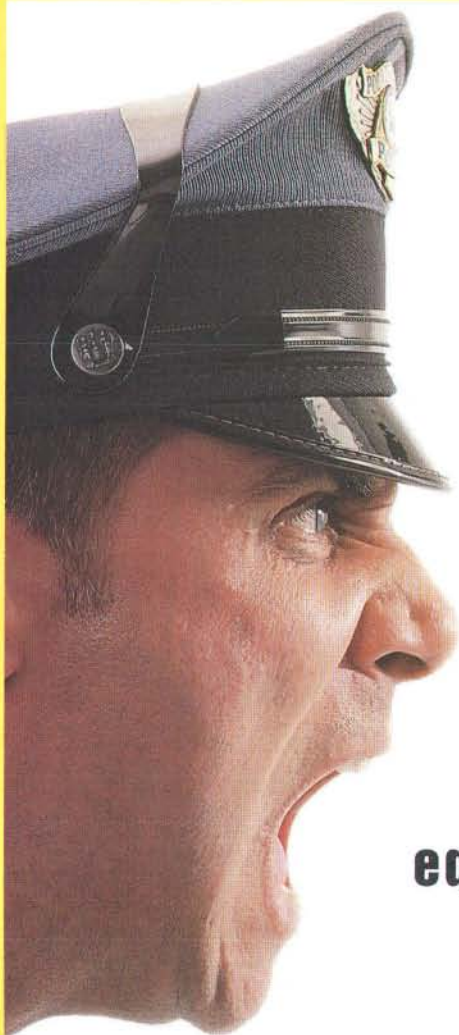
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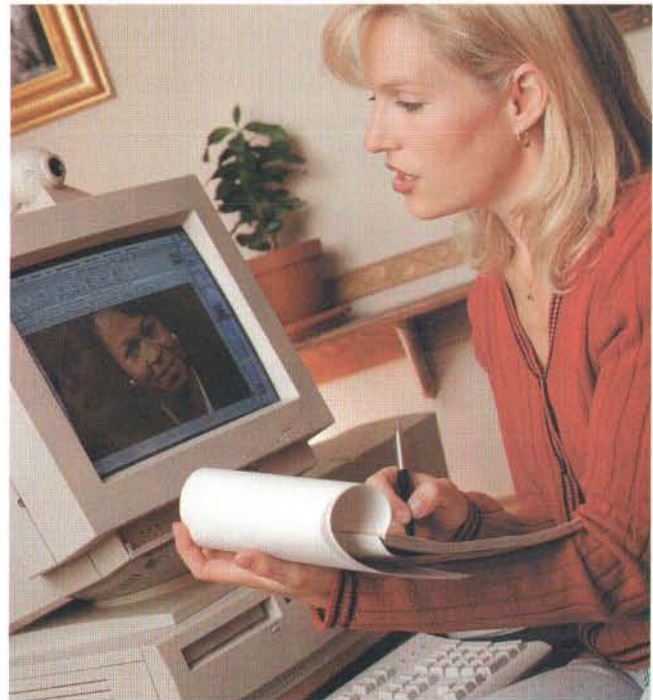
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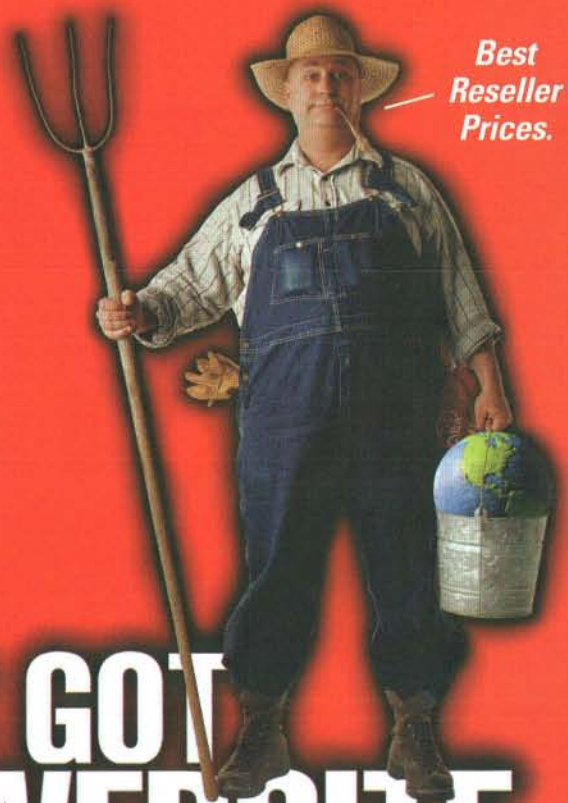


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The Development of the Domain Names Registration System

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1992

National Science Foundation awards a five-year contract to Network Solutions to become sole registrar of .com, .org, and .net domain names.

1995

Sept. 14 - Network Solutions begins charging registration fee of \$100 per domain name.

1998

June 5 - US Commerce Department releases White Paper outlining plans to phase out government involvement in the domain name system, and to introduce open competition in the registration of top-level domain names.

1998

Oct. 20 - Internet Corporation for Assigned Names and Numbers (ICANN) is created to oversee the transition of the domain name system to the private sector.

1999

April 21 - ICANN selects Internet Domain Registrars (IDR) as one of the new official domain name registrars for .com, .net, and .org domains.

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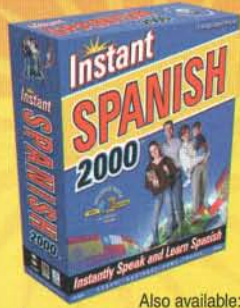
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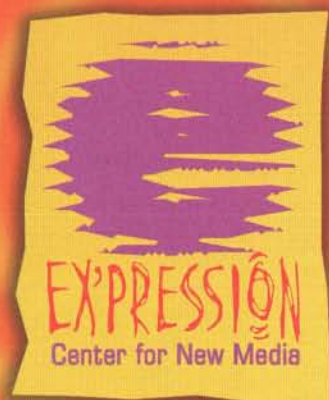
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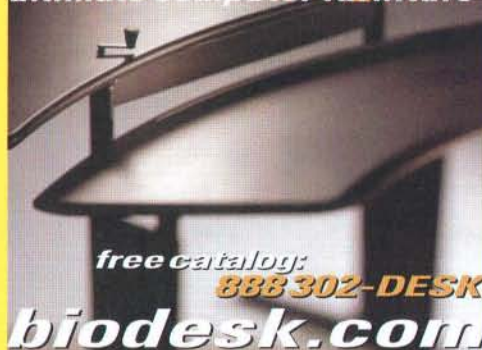
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Wordprocessing and tracking: Microsoft Office 98.

Page layout, illustration, and graphics support:

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"WHAT DOES IT DO?" Hyperfliers



June's answer: Lawrence Livermore National Laboratory's ARES supernova calculation summary shows how elements are mixed as a star explodes. Image courtesy Grant Bazan-LLNL.

Competition Rules

(See page 212.)

1. NO PURCHASE NECESSARY.

2. To enter online or via standard mail, please send an email or a postcard stating the entrant's name, address, and telephone number and correctly identifying the item shown, and its function, in this month's installment of the "What Does It Do?" contest, according to the instructions given on the feature page.

3. To enter via email, entries must be sent to

what_august@wired.com

To enter via standard mail, entries must be sent to

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Department 990801

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4. Only one correct answer will be registered per entrant per month. Contestants who have one registered correct answer at the end of the contest period (on or before January 10, 2000) will have one entry in the grand prize drawing; contestants with a total of two registered correct answers will have two; and so on. *Wired* reserves the right to discontinue the contest at any time, in which event the prize will be awarded based on entries received to date.

5. One grand prize winner of the "What Does It Do?" contest will be chosen on or before February 25, 2000, in a random drawing of qualified entries that have correctly identified items and functions in the "What Does It Do?" contests published in 1999. The winner will be notified by phone or mail within two weeks of the drawing. If the winner cannot be personally contacted within 30 days, an alternate winner may be chosen. All decisions by the judges are final.

6. The grand prize winner will receive a Harley-Davidson XL 1200S Sportster 1200 Sport. The grand prize is not transferable. No substitutions for the grand prize will be allowed except by *Wired* in case of unavailability, in which case a prize of equal or greater value will be awarded. The retail value of the grand prize is approximately \$8,500. The winner must have a valid driver's license that allows use of the prize, and is responsible for obtaining and providing evidence of insurance and for all registration, title, and other fees.

7. Income and other taxes, if any, are sole responsibility of winner.

8. The "What Does It Do?" contest is open to residents of the United States or Canada (excluding Quebec) who are 18 years of age or older as of the date of entry, except for employees of Condé Nast Publications, the fulfillment house for this promotion, contributors to *Wired*, and the families of any of the above.

9. The *Wired* "What Does It Do?" Contest is subject to all federal, state, local, and provincial laws and regulations. Void in Puerto Rico, the Canadian province of Quebec, and where prohibited. If the winner is a resident of Canada, the winner may be required to correctly answer a time-limited arithmetical skill-testing question.

10. Odds of winning the "What Does It Do?" contest depend on the number of correct entries received.

11. All entries to the "What Does It Do?" contest become the sole property of *Wired*, at *Wired*'s sole discretion, and will not be acknowledged or returned.

12. Acceptance of the grand prize constitutes consent to use the winner's name and likeness for editorial, advertising, and publicity purposes (except where prohibited by law). The winner may be required to sign an affidavit of eligibility, as well as a liability and publicity release, which must be returned within 30 days of the date of notification, or an alternate winner may be chosen.

13. Contestants, by entering the "What Does It Do?" contest, agree to be bound by the above rules and regulations.

14. For the name of the grand prize winner, send a self-addressed, stamped envelope after February 25, 2000, to *Wired* "What Does It Do?" Contest Winner, 520 Third Street, San Francisco, CA 94107.

◀ 192 face-down for a massage.)

Every attempt is being made to sequester high rollers from the rest of the airport. Directly below us, there's a drive-up window; preferred customers pull up in their limos, and a Virgin attendant walks up to the car, takes the bags from the driver, and hands over the boarding pass. Then you're hustled up a back staircase, like a movie star, into the Clubhouse, and then directly onto the plane. Onboard, the experience of separation continues. In the newest Virgin planes being built now, first-class passengers can descend a staircase into private chambers, with a bed and shower.

Increasingly, too, the more powerful hyperfliers are turning to private jets. And suddenly more can afford it because of jet time-sharing, which "is revolutionizing corporate air travel," says John Hendricks, founder of the Discovery Channel, whose company owns a one-eighth share of a Hawker 1000. With the airlines now pricing business flights through the roof, fractional jets begin to seem reasonable when divided among a group of executives. If you're wondering about the future of jet time-sharing, Hendricks says, consider the fact that Warren Buffett has thrown his money behind Executive Jet, one of the pioneers in the category.

Of course, there's one more option for the elite, which doesn't involve concealed chambers on planes or time-shares in the sky: Stay grounded. "More and more, senior executives are sending the young lions out there," says travel agent Oberle. "They don't want to fly anymore." Iconoculture's Abrahamson concurs: "The upper-level executives are already starting to hire young traveling teams, global employees who don't really have a home."

This is the new, stationary elite — those who use their power to stay put. "The luxury is to have the intellectual capital come to you," says Meyer. "We see it in diplomatic protocol, and in Hollywood. Who-goes-to-whom is important; I believe this all got started with the mountain and Muhammad."

And hyperflying execs are ready to hang up their miles. "Before, I used to fly to meetings for a day," says Lotus' Shelleness. "This year I'm saying, 'I'm not going to go. I'll video-conference, I'll get on the phone, I'll email. But I won't go.' I've never really tried this before. At the end of the year, I'll look back and see if it's been a disaster."

But even if the fast-paced business world permits them to cut back, the hyperfliers will face an adjustment on the ground. "We all complain about travel," says Finocchio, "but deep down, we'd be more uncomfortable strapped to our chairs in the office."

Evan Orensten insists he has little choice but to fly on behalf of his growing company, and he isn't ready to land just yet. En route to Stockholm, on his third flight of the day, he writes another email from the clouds: "Where am I?" he writes. "Somewhere over Denmark, I think ..." ■ ■ ■

WHAT DOES IT DO?

Last year this mysterious mass appeared in a field outside Utrecht, a 2001-like monument to the region's new satellite city. You can pound your fist on it, climb on top of it, or dig underneath it, but it will always burn far more calories than you do. For now, the polyurethane-coated edifice serves a community of swifts that nest on the roof, but its builders had more than birdbaths in mind. Think, instead, of hot showers – 12,000 of them.

What is it, anyway? And what does it do?

THE WIRED CONTEST

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